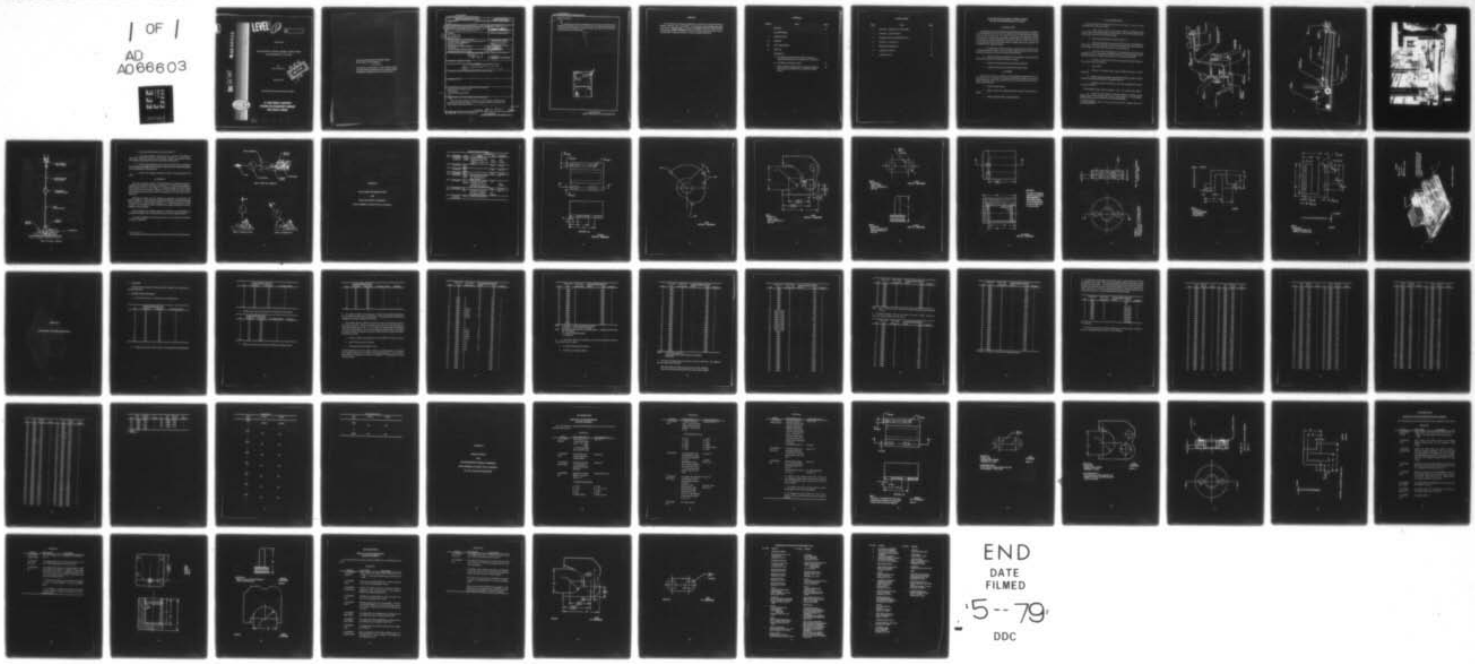
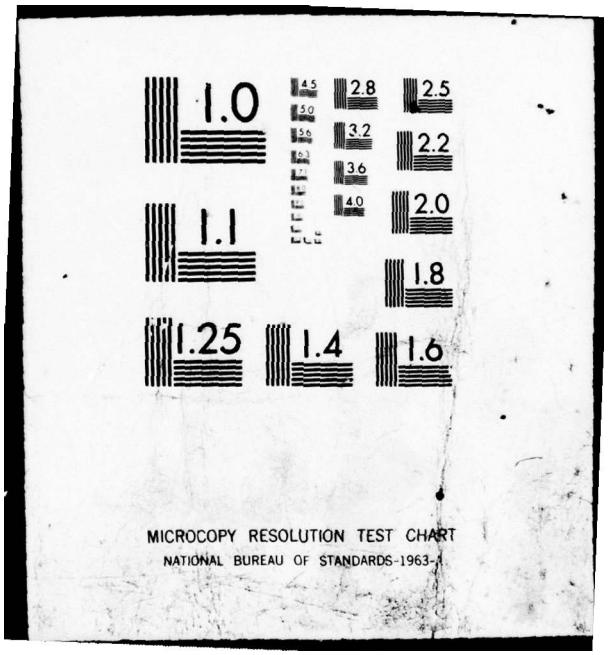
AD-A066 603 ARMY MOBILITY EQUIPMENT RESEARCH AND DEVELOPMENT COMM--ETC F/G 13/6
QUICK-DISCONNECT HOUSING ASSEMBLY DESIGN REVIEW AND PERFORMANCE--ETC(U)
DEC 78 J H ALLISON

UNCLASSIFIED MERADCOM-2264 NL

| OF |
AD
AD66603



END
DATE
FILMED
5-79
DDC


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

LEVEL II

AD

Report 2264

QUICK-DISCONNECT HOUSING ASSEMBLY DESIGN REVIEW AND PERFORMANCE EVALUATION

by

John H. Allison, Jr.

December 1978

Approved for public release; distribution unlimited.

U.S. ARMY MOBILITY EQUIPMENT
RESEARCH AND DEVELOPMENT COMMAND
FORT BELVOIR, VIRGINIA

Destory this report when it is no longer needed.
Do not return it to the originator.

The citation in this report of trade names of commercially available products does not constitute official endorsement or approval of the use of such products.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER: 2264 ✓	2. GOVT ACCESSION NO. / 3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle): (6) QUICK-DISCONNECT HOUSING ASSEMBLY DESIGN REVIEW AND PERFORMANCE EVALUATION.	5. TYPE OF REPORT & PERIOD COVERED: (9) Final rept. Feb – Jul 1978
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): (10) John H. Allison, Jr.	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS: US Army Mobility Equipment Research and Development Command; ATTN: DRDME-NN ✓ Fort Belvoir, VA 22060	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: (16) Project 1M664612D415
11. CONTROLLING OFFICE NAME AND ADDRESS: Commander US Army Mobility Equipment Research and Development Command; Fort Belvoir, VA 22060	12. REPORT DATE: (11) December 1978 / 13. NUMBER OF PAGES: 63
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office): (12) 63 p.	15. SECURITY CLASS. (of this report): Unclassified / 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report): Approved for public release; distribution unlimited. (14) MERADCOM-2264	
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)	
18. SUPPLEMENTARY NOTES	
19. KEY WORDS (Continue on reverse side if necessary and identify by block number): Quick-Disconnect Housing Assembly; QD Mechanism; Track-Width Mine-Clearing Roller	
20. ABSTRACT (Continue on reverse side if necessary and identify by block number): This final report describes the design study and performance evaluation of the Quick-Disconnect Housing Assembly for use in conjunction with the Track-Width Tank-Mounted Mine-Clearing Roller System. (Continued) 403 160 over	

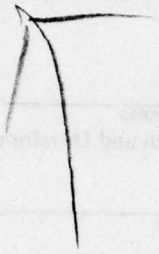
DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

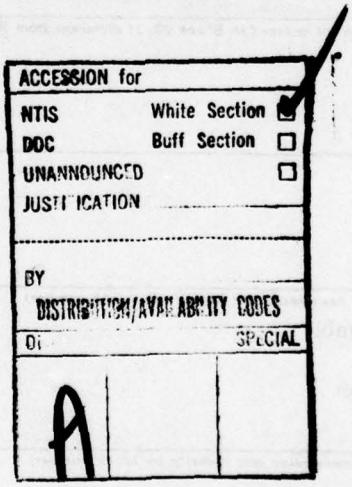
UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

(Block 20. (Cont'd))

The Quick-Disconnect Housing Assemblies have been a source of problems for the Minefield Roller Program from the onset of field trials. The final design item described in this report solves all problems encountered to date and is felt to be the best system attainable without a total design change.





PREFACE

The design study and subsequent performance evaluation of the Quick-Disconnect Housing Assembly were accomplished during February 1978 through July 1978 under Project 1M664612D415. Principal investigators were John Allison of Mine Neutralization Division, Countermine Laboratory; Hayward Glaspell and John Tyler of the R&D Model Fabrication Division, Services and Support Directorate.

CONTENTS

Section	Title	Page
	PREFACE	iii
	ILLUSTRATIONS	v
I	INTRODUCTION	1
II	PURPOSE	1
III	TEST PROCEDURE	2
IV	RESULTS	7
	APPENDICES	
	A. Final Design Recommendation for Quick-Disconnect Assemblies (Part Numbers 13222E0052 and 13222E0053)	9
	B. Test History and Results in Detail	20
	C. Design Changes for Quick-Disconnect Housing Assemblies (Part Numbers 13222E0052 and 13222E0053. History Folder.)	38

ILLUSTRATIONS

Figure	Title	Page
1	Test Setup – Hydraulic Circuit Simulation	3
2	Test Setup – Load Simulation	4
3	Equipment Used in Load Simulation Test	5
4	Test Setup – Locking Test	6
5	Release Test Configuration	8
6	Locking Test, Vertical	8
7	Locking Test, 45°	8

QUICK-DISCONNECT HOUSING ASSEMBLY DESIGN REVIEW AND PERFORMANCE EVALUATION

I. INTRODUCTION

The Quick-Disconnect (QD) Housing Assemblies (Part Numbers (PN) 13222E0052 and 13222EOO53) have been sources of problems for the Minefield Roller Program from the onset of field trials. In an effort to correct the many deficiencies, the QD mechanism has undergone four generations of modifications. The final item described by Appendix A solves all problems encountered to date and is felt to be the best system attainable without total design change. Basically, the fourth generation unit is composed of the following changes:

a. Enlarged jaws to permit freedom of movement of the cable eye, thus avoiding bending and shearing of pins and spline shafts during both lock and release operations, excessive jaw wear, and excessive post deformation.

b. Improved material characteristics and compatibility through carefully planned heat treatments and judicious selection of material.

c. Positive cam indexing through careful plunger adjustment.

d. Lengthened piston travel to permit full travel jaw release.

II. PURPOSE

This series of tests was an effort to verify performance characteristics of the QD model in such a manner as to simulate actual field conditions or, at least, to verify performance under worse conditions than those encountered in the field. Performance depended upon:

a. Ability to release reliably.

b. Ability to lock, thus avoiding inadvertent release under adverse conditions.

c. Ability to operate without component failure.

III. TEST PROCEDURE

The test setup and the equipment used are shown in Figures 1, 2, and 3. The test procedure for the release tests follows:

a. Open valves A and B in order to insure against an inadvertent release of the cable eye and possible injury to test personnel. This provides hydraulic fluid flow into the reservoir, not to the QD mechanism.

b. Set up the load simulation as shown in Figure 2.*

c. Close QD mechanism, insuring that the yoke (PN 13222EOO34) is fully closed. When fully closed, the yoke will have "snapped" into position denoting that the piston is fully retracted and the cam is in a locked position.

d. Extend the 10-ton hydraulic jack by closing the jack bleed valve and pumping the handle. This forces the forklift away from the QD mechanism, thereby increasing tension on the chain and cable eye force on the base plate assembly.

e. Continue to extend the jack until the desired cable load is achieved. Then clear the area of all personnel.

f. Close valve B.

g. Utilizing the hydraulic pump, increase hydraulic pressure to the QD mechanism.

h. Monitor hydraulic pressure, recording the maximum pressure required to actuate the QD mechanism thereby releasing the cable eye.

i. Following release of the cable eye, open valve B allowing the pressure to return to 0 $lb/in^2 g$.

The locking-test setup is shown in Figures 1 and 4. The test procedure follows:

a. In order to insure against an inadvertent release of the cable eye and possible injury to test personnel, open valves A and B (Figure 1). This establishes hydraulic fluid flow into the reservoir, not to the QD mechanism.

---

* The angle of application is adjusted by varying the height of the forklift tines. Regradless of angle, the test procedure remains the same.

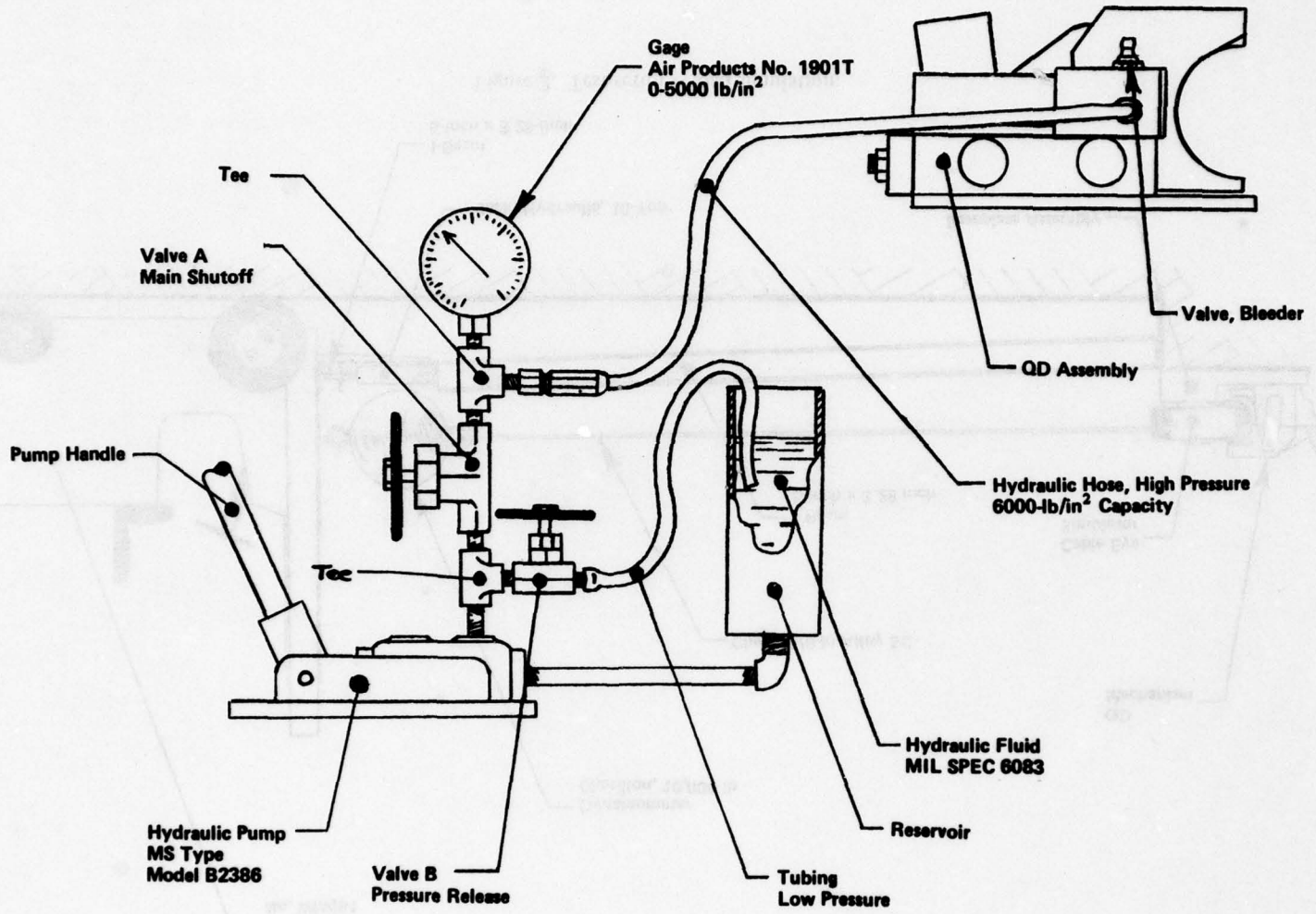


Figure 1. Test setup – hydraulic circuit simulation.

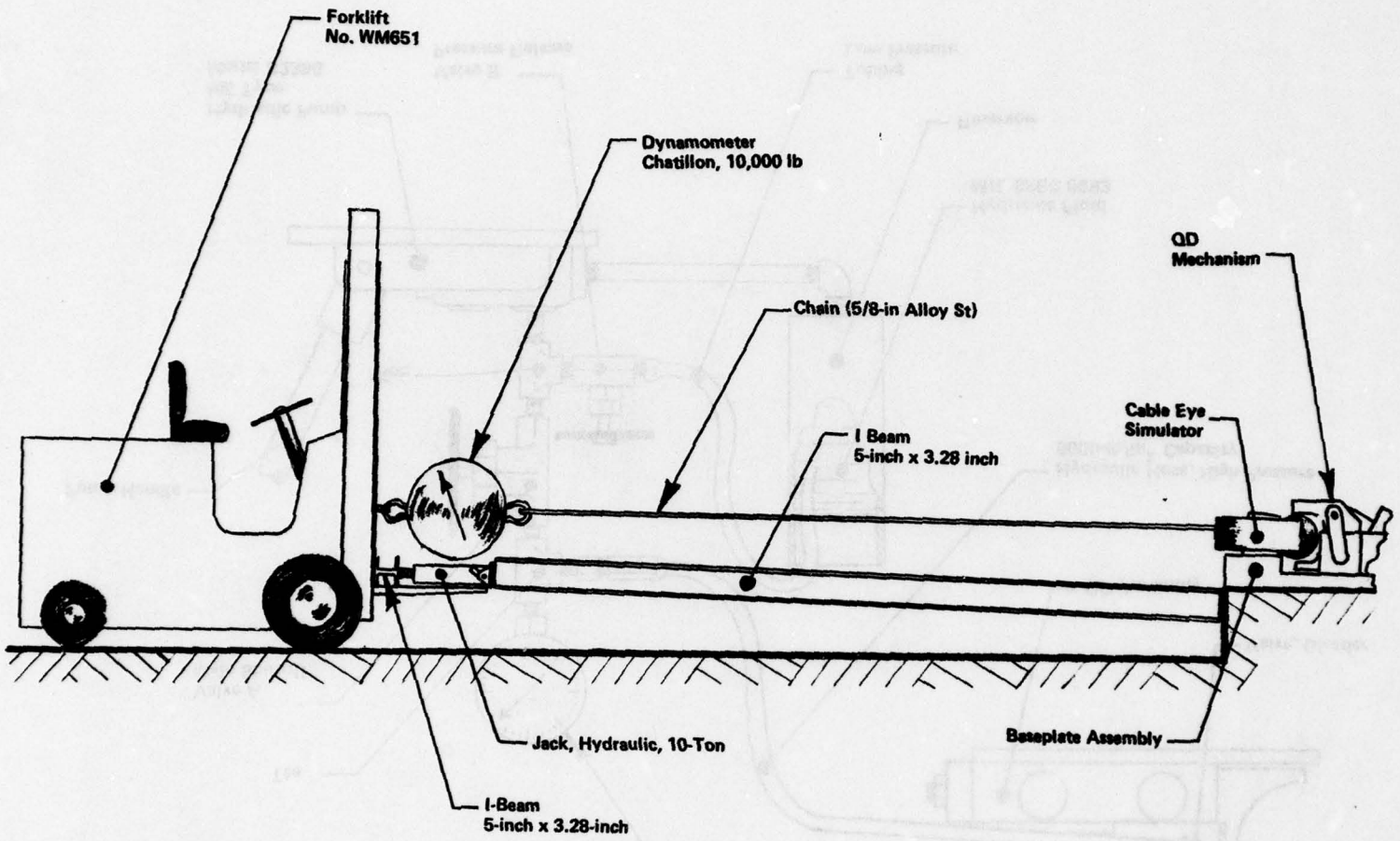


Figure 2. Test setup – load simulation.

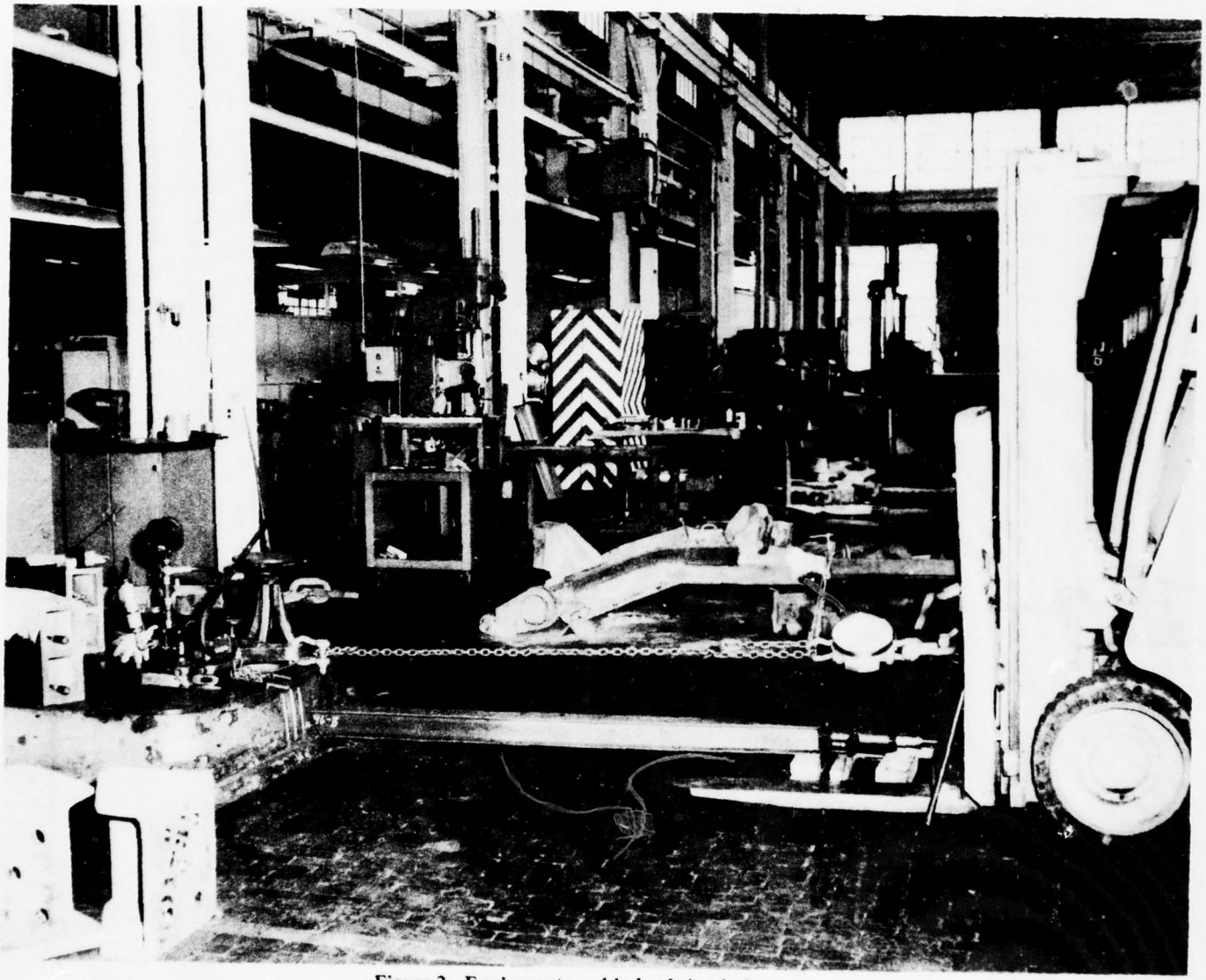


Figure 3. Equipment used in load simulation test.

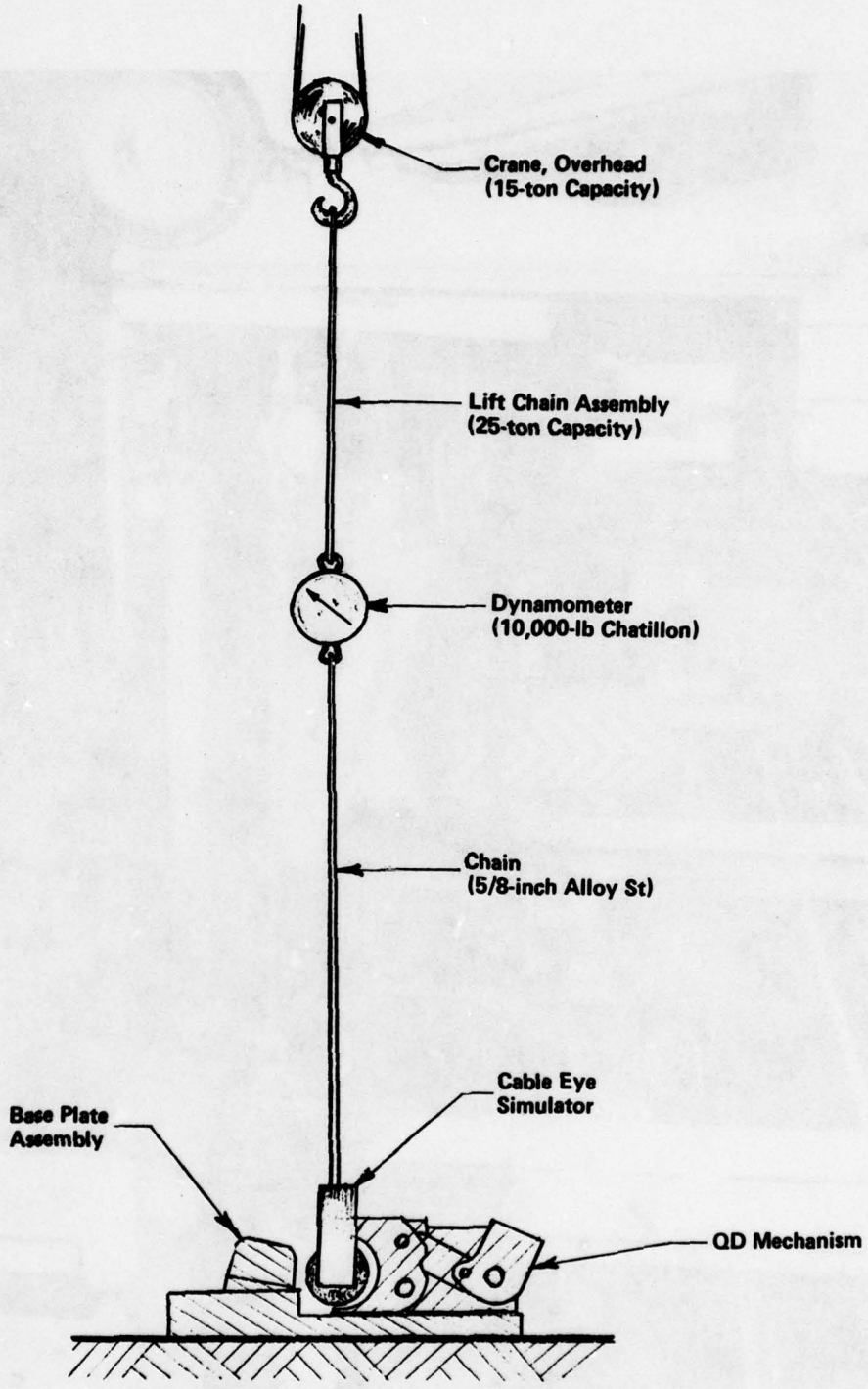


Figure 4. Test setup – locking test.

b. Set up the load simulation as shown in Figure 4.*

c. Close QD mechanism, insuring that the yoke (PN 13222EOO84) is fully closed. When fully closed, the yoke will have "snapped" into position denoting that the piston is fully retracted and the cam is in the locked position.

d. Prior to load application, insure that the test area is clear of personnel. Raise the remote controlled crane as rapidly as possible until the desired load appears on the dynamometer. Release the load.

e. Check the mechanism carefully for signs of release (opening of the yoke).

IV. RESULTS

The fourth generation model of the Quick-Disconnect Housing Assembly has undergone 561 releases of cable loads varying from 0 to 10,000 pounds applied at angles varying from -40° to +10° (Figure 5). During this period, four release failures were noted (0.7 percent failure). However, all of these failures were due to badly worn and deformed posts, and the cable eye simulator was of 4130 steel in the annealed state.

Following the release tests, the assembly was subjected to vertical pull tests (shown in Figure 6). After 50 rapidly exerted pulls varying from loads of 1,000 pounds and 10 pulls at 45° exerted as shown in Figure 7 (5 at 5,000 pounds and 5 at 10,000 pounds), it was concluded that the modifications in no way jeopardized the locking capability of the mechanism.

Having completed all scheduled testing, the mechanism was disassembled and inspected for damage or wear. The assembly was found to be in original condition.

A complete breakdown of the tests conducted, the test results, and comments are shown in Appendix B.

* Angle of application is adjusted by varying the position of the overhead crane with respect to the QD mechanism.

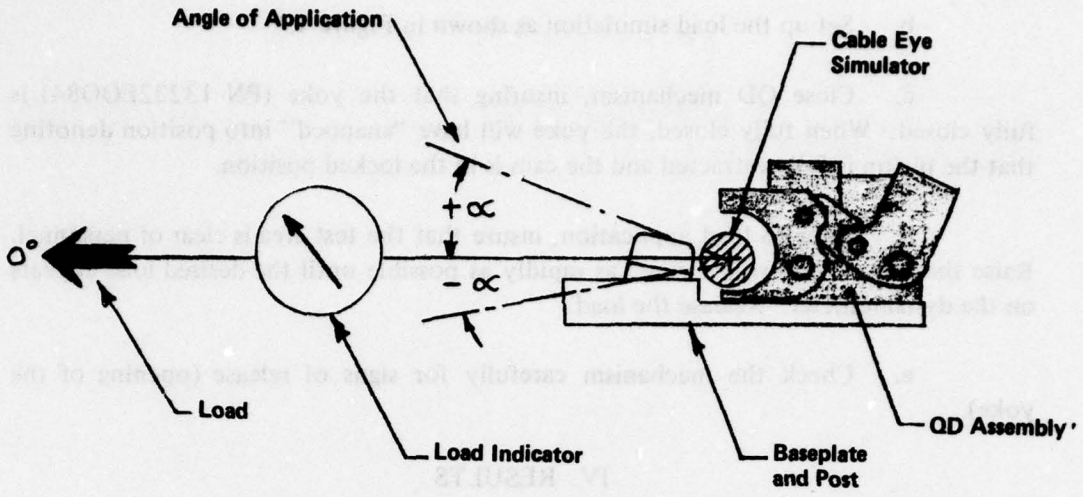


Figure 5. Release Test Configuration.

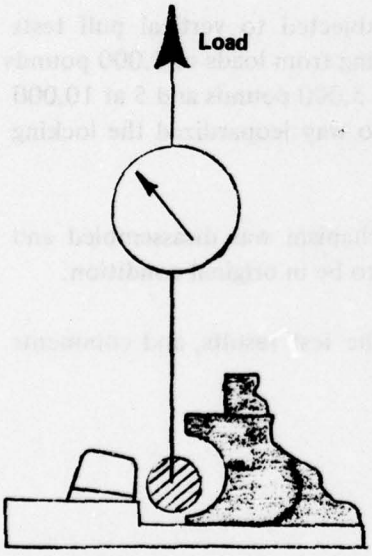


Figure 6. Locking test, vertical.

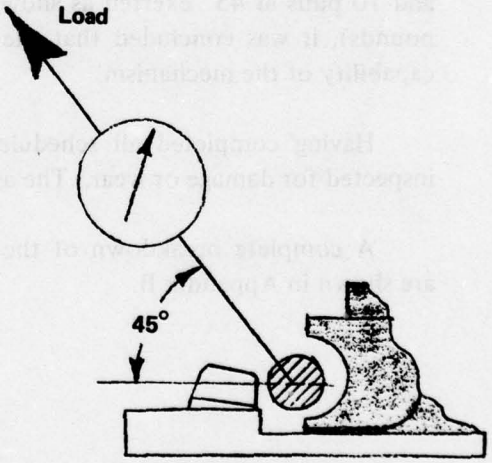


Figure 7. Locking test, 45°.

APPENDIX A

FINAL DESIGN RECOMMENDATION

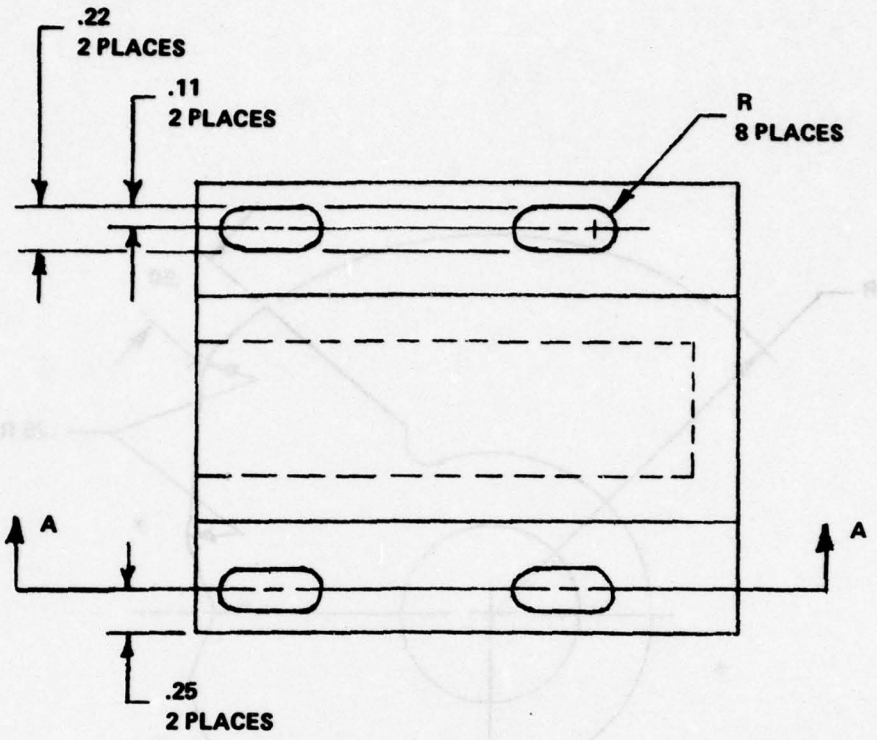
FOR

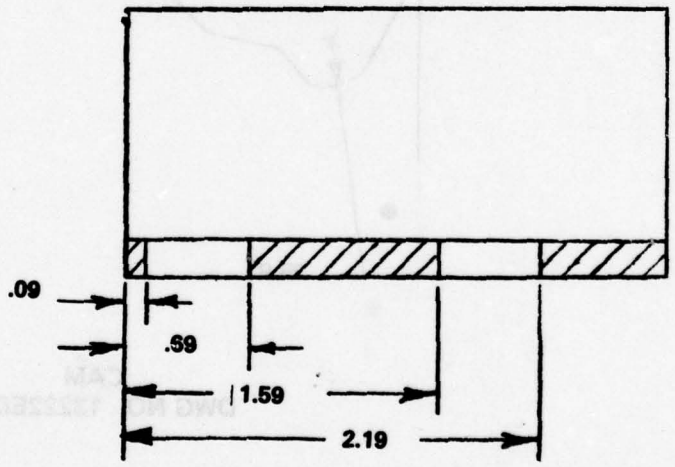
QUICK-DISCONNECT ASSEMBLIES

(PART NUMBERS 13222EOO52 AND 13222EOO53)

Changes Not Shown By Drawings

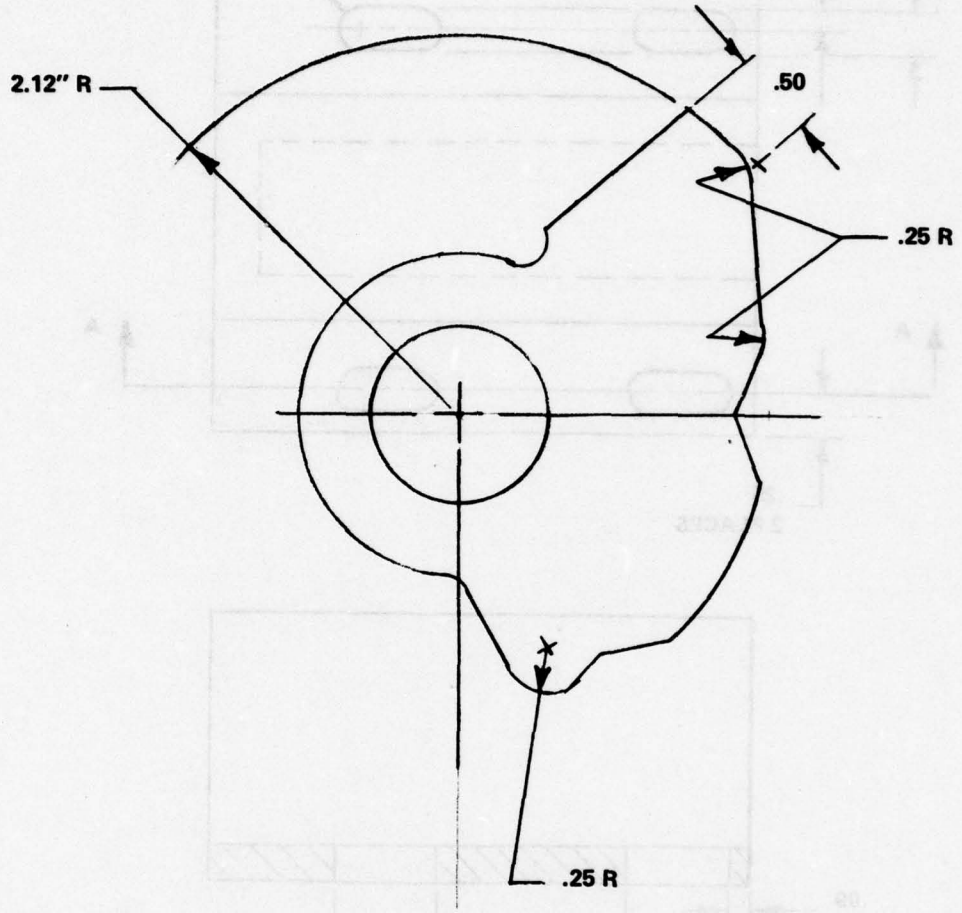
No.	Drawing No.	Name	Modifications		
			Changes	Steel	Rockwell C
1	13222EOO78 13222EOO79	Housing Assembly	Locator Dowel Pins 3 Req. – Hardened Alloy Steel, .375 +.0002 −.0000 Dia x 1.000 in. long	– None Specified	– None Specified
2	13222EOO83	Shaft Spline	–	4340	40 to 45
3	13222EOO82	Shaft Spline	–	4340	40 to 45
4	13222EOO87	Lever	–	4130	35 to 40
5	13222EOO92	Plunger, Spring	Disassemble & Remove Plunger – Case Harden Same – Light Case Only	–	60
6	13222EOO76	Plate Assembly	Shorten Locator Dowel Pin to .188 Dia x 1.00 in. LG. If Housing is Cast, Include This as Part of Housing Casting	4130	– None Specified
7	13222EOO86	Pin	–	4340	40 to 45
8		Cam	Case Harden to a Depth of .07 in. Max. Also Round Off as Shown on Drawing	– None Specified	60
9	13222EOO52 13222EOO53	Housing	Excellent Casting Candidate		



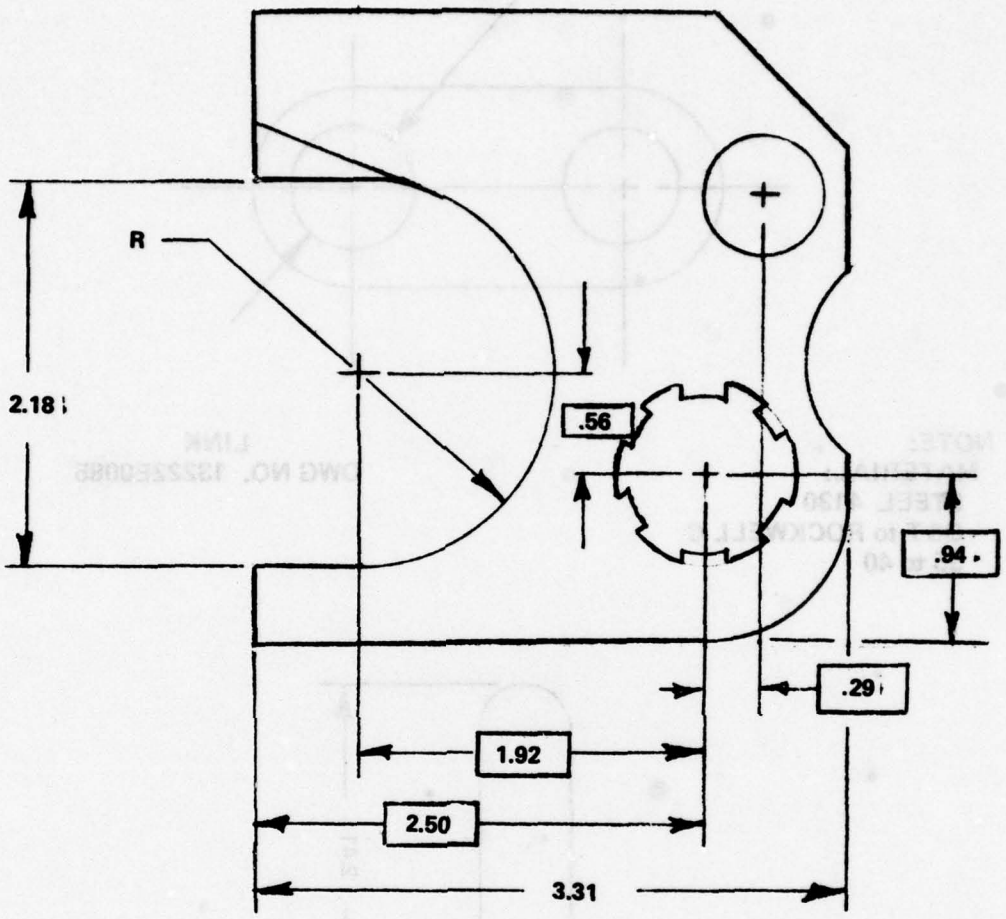


SECTION A-A

COVER
DWG NO. 13222E0079

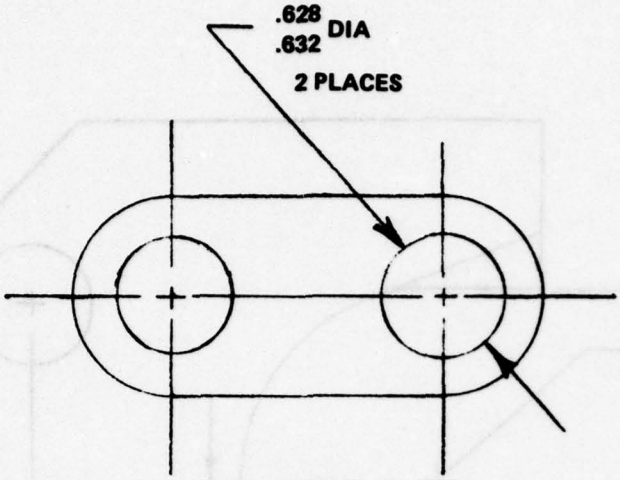


CAM
DWG NO. 13222E0081



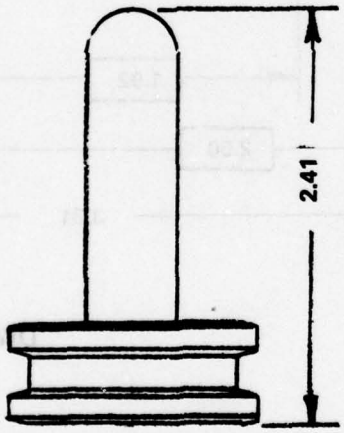
NOTE:
MATERIAL:
STEEL 4130
Q&T to ROCKWELL C
35 to 40

YOKE
DWG NO. 13222E0084



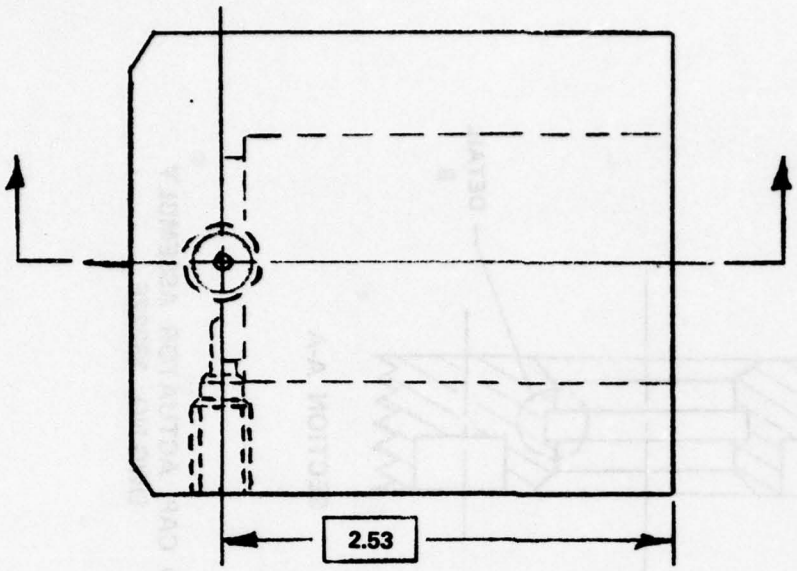
NOTE:
MATERIAL:
STEEL 4130
Q&T to ROCKWELL C
35 to 40

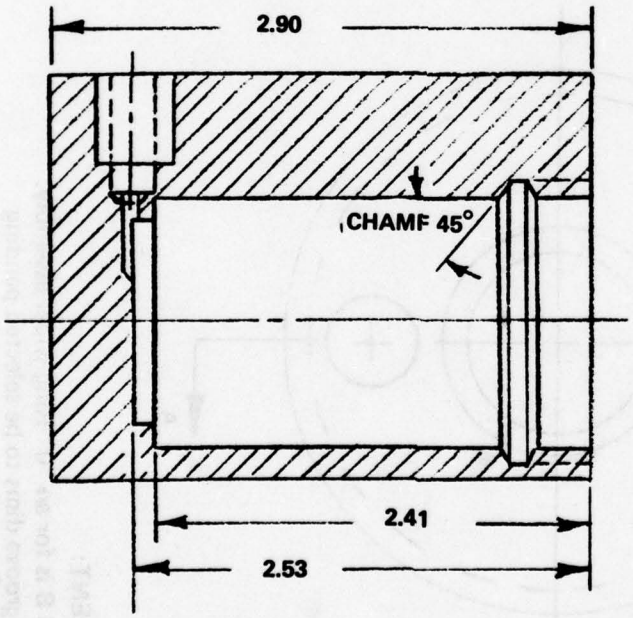
LINK
DWG NO. 13222E0085



NOTE:
MATERIAL:
STEEL, ALLOY, 4130
Q&T to ROCKWELL C
35 to 40

PISTON
DWG NO. 13222E0098

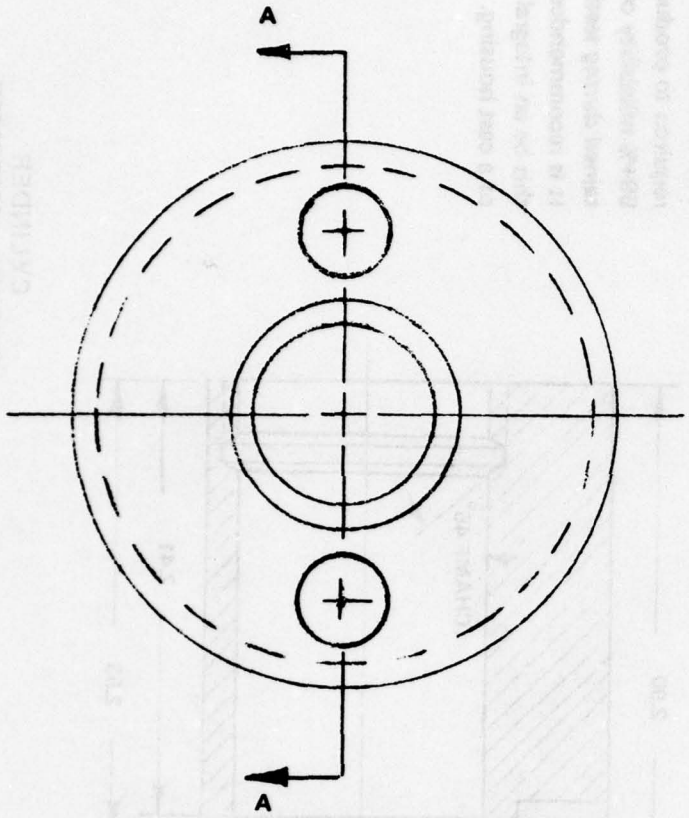


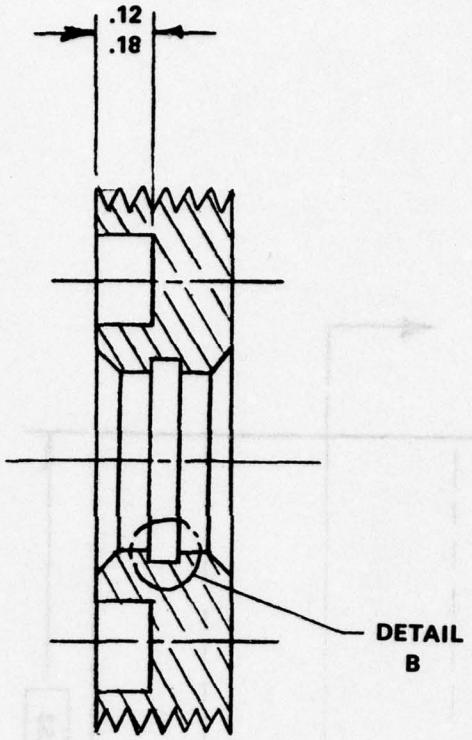


COMMENT:

This reflects all changes required to produce the 99+% reliability obtained during testing. It is recommended that this be an integral part of a cast housing.

CYLINDER
DWG NO. 13222E0097



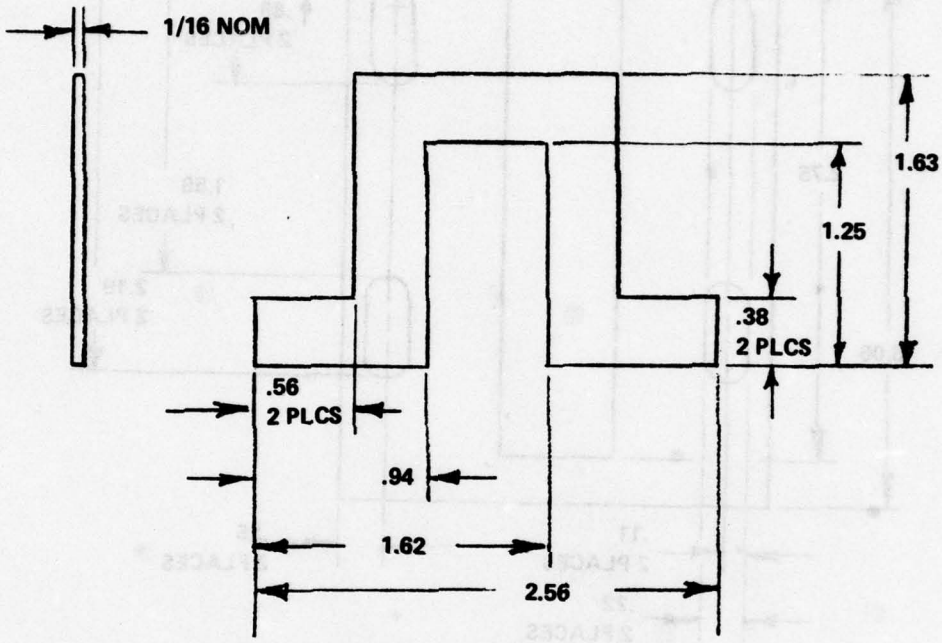


SECTION A-A

COMMENT:

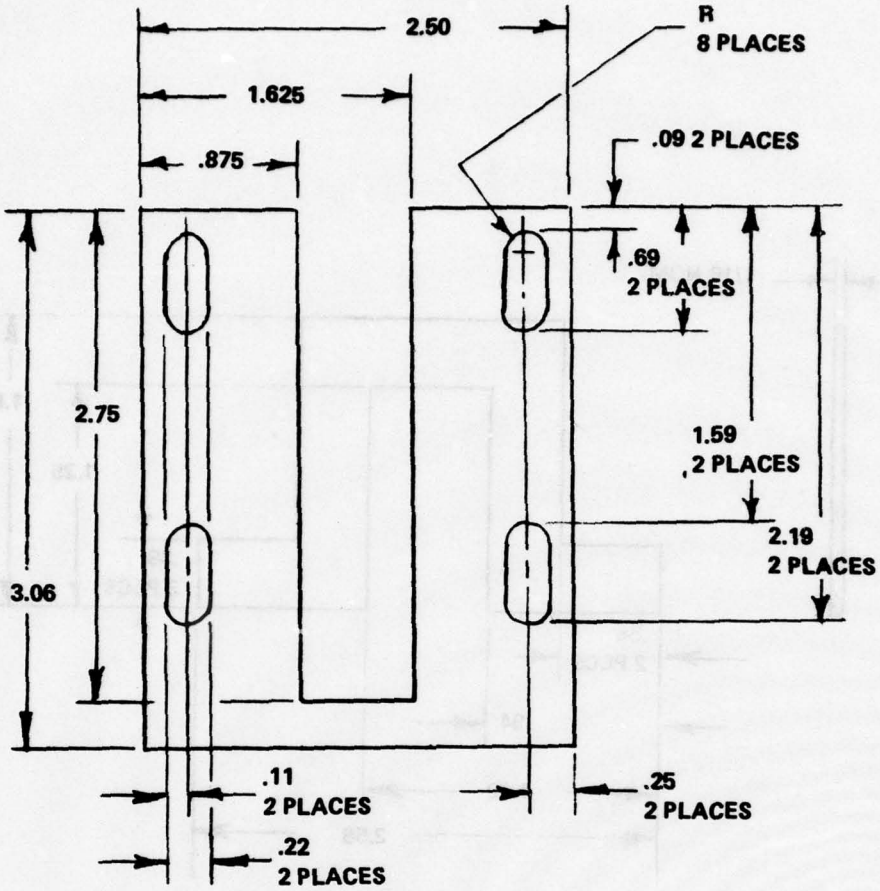
Detail B is for an "0" Ring wiper assembly. Final groove dims to be selected pending "0" Ring choice.

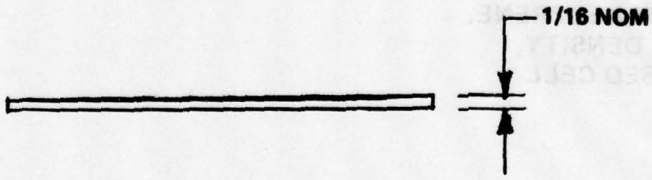
END CAP, ACTUATOR ASSEMBLY
DWG NO. 13222E



GASKET

NOTE:
MATERIAL:
FOAM NEOPRENE,
MED DENSITY,
CLOSED CELL





GASKET

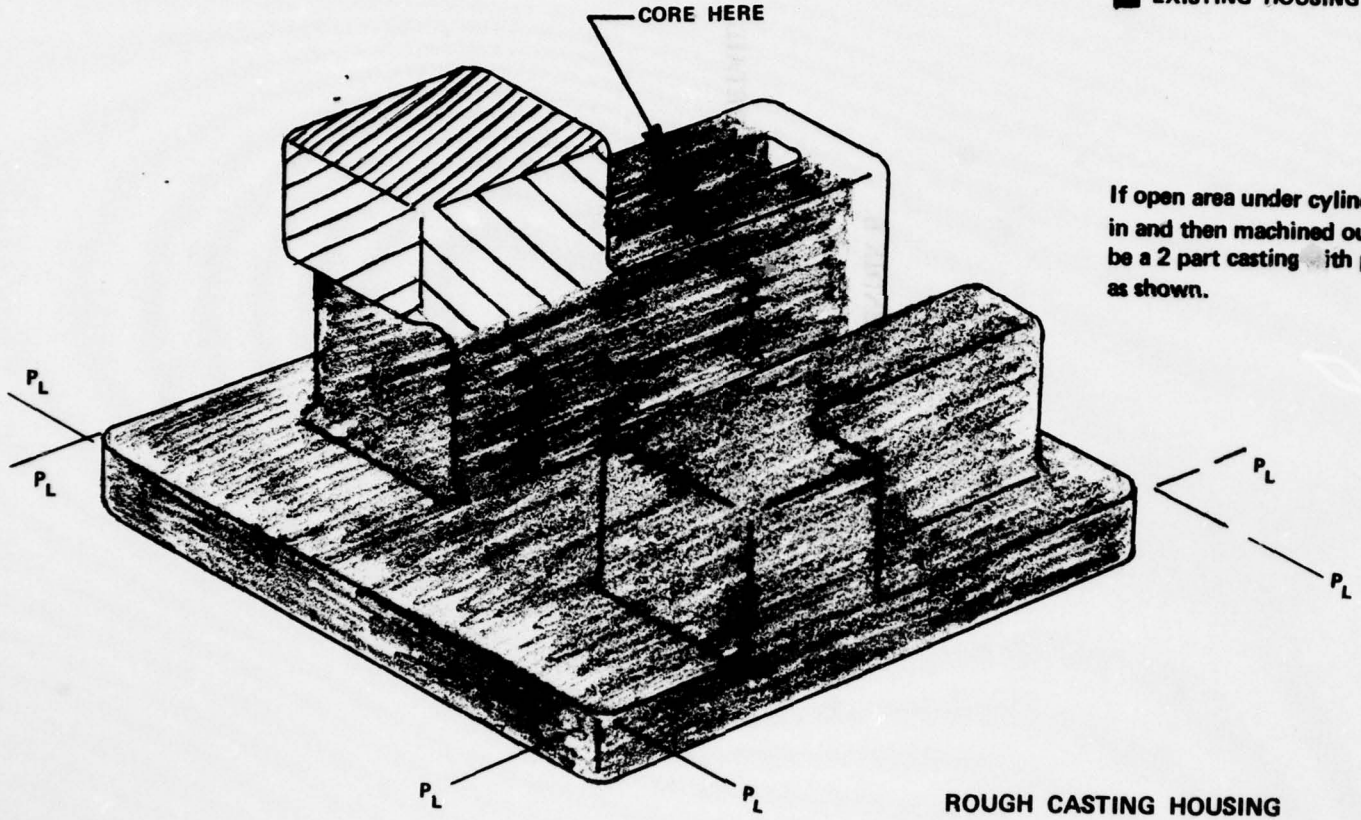
NOTE:
MATERIAL:
FOAM NEOPRENE, MED
DENSITY, CLOSED-CELL.

LEGEND

CYLINDER

END CAP

EXISTING HOUSING



If open area under cylinder were filled in and then machined out, this could be a 2 part casting with parting line as shown.

ROUGH CASTING HOUSING

APPENDIX B

TEST HISTORY AND RESULTS IN DETAIL

1. **Item Tested:**

Quick-disconnect mechanism (third generation, Appendix B) contains data on this particular model.

2. **Hydraulic System Characteristics:**

a. Release-test procedure, no cable hookup; see following table:

No.	Actuator Pressure ($lb/in^2 g$)		If Complete Stroke
	To Unlock	Full Travel	
1	25	50	✓
2	20	60	✓
3	25	60	✓
4	20	60	✓
5	20	60	✓
6	20	60	✓
7	20	60	✓
8	20	50	✓
9	20	55	✓
10	20	60	✓
11	20	50	✓
12	20	60	✓
13	20	60	✓
14	20	60	✓
15	18	50	✓

b. Release-test procedure, cable hookup, no load applied; see following table:

No.	Actuator Pressure (lb/in^2g) To Unlock	Full Travel	If Complete Stroke
1	20	50	✓
2	20	55	✓
3	20	55	✓
4	20	55	✓
5	20	55	✓
6	18	55	✓
7	20	50	✓
8	20	55	✓
9	20	55	✓
10	20	55	✓

c. Release-test procedure, cable preload of 1,000 lb; see following table:

No.	Actuator Pressure (lb/in^2g) To Unlock	Full Travel	If Complete Stroke	If Release
1	20	450	✓	✓
2	20	550	✓	
3	15	450	✓	
4	20	470	✓	
5	20	430	✓	
6	20	420	✓	
7	20	410	✓	
8	20	405	✓	
9	20	405	✓	
10	20	405	✓	

d. Release-test procedure, cable preload of 2,000 lb; see following table:

No.	Actuator Pressure (lb/in^2g) To Unlock	Full Travel	If Complete Stroke	If Release
1	25	730	✓	
2	20	630	✓	
3	20	630	✓	
4	20	650	✓	
5	20	650	✓	✓
6	20	700	✓	✓
7	20	580	✓	✓
8	20	700	✓	
9	20	710	✓	
10	15	690	✓	✓

3. In an effort to explain the inconsistency of release, the hydraulic cylinder assembly was studied carefully under load conditions. It was apparent that the piston was travelling ¼ inch prior to engagement of the cam.

This coupled with the obvious fact that the "yoke" did not lift the cable eye far enough to provide a positive and reliable release gave rise to the placement of a ¼-inch plate against the cam face. Five actuations were made against a 2,000-lb load with five successful releases. Thus, it was concluded that piston travel was sufficient to provide a positive and reliable cable release (100% of the time) if one of the following changes were made:

a. Relocate cylinder mounting holes to move cylinder 0.25 inch to the rear.

b. Add ¼ inch face to the cam surface.

c. Or increase the piston length 0.25 inch.

For field expediency, item c was chosen. Results are as shown below. In the interest of best design, however, item a should be the implemented choice. Item c leads to a piston that will eventually bend and jam the mechanism. The following are the results of further testing:

No.	Cable Load (lb)	Cable Angle to Horizon (°)	Actuator Pressure ($lb/in^2 g$) Unlock	Trial	If Release
1	0		12	12	
2	0		10	10	
3	0		10	10	
4	0		10	10	
5	0		10	10	
6	1000	0	10	350	√
7	1000	0	10	340	√
8	1000	0	10	330	√
9	1000	0	8	330	√
10	1000	0	10	430	√
11	1000	14 down	30	390	√
12	1000	14 down	37	300	√
13	1000	14 down	10	350	√
14	1000	14 down	50	310	√
15	1000	14 down	37	380	√
16	2000	0	5	800	√
17	2000	0	5	790	√
18	2000	0	5	700	√
19	2000	0	5	590	√
20	2000	0	5	600	√
21	2000	14 down	10	580	√
22	2000	14 down	10	740	√
23	2000	14 down	37	630	√
24	2000	14 down	50	580	√
25	2000	14 down	37	730	√
26	2000	10 up	5	280	√
27	2000	10 up	5	360	√
28	2000	10 up	12	460	√
29	2000	10 up	10	500	√
30	2000	10 up	12	600	√
31	5000	0	–	1550	√
32	5000	0	–	1650	√
33	5000	0	–	1700	√
34	5000	0	–	1700	√
35	5000	0	–	1650	√
36	6000	0	–	1850	√
37	6000	0	–	1750	√
38	6000	0	–	1900	√
39	6000	0	–	1850	√

No.	Cable Load (lb)	Cable Angle to Horizon (°)	Actuator Pressure (lb/in^2g) Unlock	Trial	If Release
40	6000	0	–	1850	✓
41	7000	0	–	2500	✓
42	7000	0	–	1650	✓
43	7000	0	–	2350	✓
44	7000	0	–	2200	✓
45	7000	0	–	2350	✓
46	8000	0	–	3000	✓
47	8000	0	–	2250	✓
48	8000	0	–	2550	✓
49	8000	0	–	2950	✓
50	8000	0	–	2500	✓
51	9000	0	–	3200	✓
52	9000	0	–	3750	✓
53	9000	0	–	3400	✓
54	9000	0	–	2900	✓
55	9000	0	–	2400	✓
56	10,000	0	–	3100	✓

NOTE: 47 through 50 – increases about 200 lb during release.
51 through 52 – increase of 600 lb during release.

NOTE: Simulated cable yoke worn down to inoperable condition – replaced and test was continued – 53rd sequence.
56 – increase of 600 lb during release.
– No Data Taken

4. At this point, testing was discontinued and the piston shortened 0.06 inch. This was done for two reasons:

a. To ensure manual-locking conditions.

b. To obtain a max design condition.

No.	Cable Load (lb)	Cable Angle to Horizon (°)	Actuator Pressure (lb/in^2g) Unlock	Trial	If Release
1	1000	0	–	300	✓
2	1000	0	–	375	✓
3	1000	0	–	340	✓
4	1000	0	–	480	✓
5	1000	0	–	350	✓
6	2000	0	–	730	✓
7	2000	0	–	630	
8	2000	0	–	630	✓
9	2000	0	–	600	✓
10	2000	0	–	650	✓
11	3000	0	–	800	✓
12	3000	0	–	900	✓
13	3000	0	–	910	✓
14	3000	0	–	800	✓
15	3000	0	–	900	✓
16	4000	0	–	1150	✓
17	4000	0	–	1050	✓
18	4000	0	–	1100	✓
19	4000	0	–	1050	✓
20	4000	0	–	1000	✓
21	5000	0	–	1350	✓
22	5000	0	–	1350	✓
23	5000	0	–	1200	✓
24	5000	0	–	1400	✓
25	5000	0	–	1515	✓
26	6000	0	–	1500	✓
27	6000	0	–	1600	✓
28	6000	0	–	1450	✓
29	6000	0	–	1550	✓
30	6000	0	–	1350	✓

NOTE: 7 – badly cocked to begin with.
full-open but chain was cocked and did not come off peg.
– No Data Taken

5. The piston was again shortened 0.03 inch (a total of 0.09 inch). The following are the results of that shortening:

Max clear 0.034 inch between piston and cam in closed condition.
Norm clear 0.010 inch between piston and cam in closed condition.

No.	Cable Load (lb)	Cable Angle to Horizon (°)	Actuator Pressure (lb/in^2g) Unlock	Trial	If Release
1	1000	0	–	325	✓
2	1000	0	–	350	✓
3	1000	0	–	425	✓
4	1000	0	–	325	✓
5	1000	0	–	350	✓
6	2000	0	–	600	✓
7	2000	0	–	550	✓
8	2000	0	–	525	✓
9	2000	0	–	600	✓
10	2000	0	–	550	✓
11	3000 to 3300	0	–	875	✓
12	3000 to 3300	0	–	800	✓
13	3000 to 3300	0	–	750	✓
14	3000 to 3300	0	–	800	✓
15	3000 to 3300	0	–	900	✓
16	3000 to 3300	0	–	775	✓
17	3000 to 3300	0	–	650	✓
18	3000 to 3300	0	–	900	✓
19	3000 to 3300	0	–	800	✓
20	3000 to 3300	0	–	750	✓
21	4000	0	–	900	✓
22	4000	0	–	1100	✓
23	4000	0	–	1100	✓
24	4000	0	–	975	✓
25	4000	0	–	1150	✓
26	4000	0	–	1025	✓
27	4000	0	–	1100	✓
28	4000	0	–	1150	✓
29	4000	0	–	1150	✓
30	5000	0	–	1200	✓
31	5000	0	–	1475	✓
32	5000	0	–	1325	✓
33	5000	0	–	1450	✓
34	5000	0	–	1400	✓
35	5000	0	–	1400	✓
36	5000	0	–	1350	✓
37	5000	0	–	1400	✓
38	5000	0	–	1425	✓
39	5000	0	–	1400	✓

No.	Cable Load (lb)	Cable Angle to Horizon (°)	Actuator Pressure (lb/in^2g) Unlock	Trial	If Release
40	5000	0	–	1700	✓
41	6000	0	–	1850	✓
42	6000	0	–	1700	✓
43	6000	0	–	1650	✓
44	6000	0	–	1600	✓
45	6000	0	–	1600	✓
46	6000	0	–	1650	✓
47	6000	0	–	1600	✓
48	6000	0	–	1600	✓
49	6000	0	–	1575	✓
50	6000	0	–	1600	✓

NOTE: No. 45 – Cable eye now worn to point it will no longer release without being forced off by QD yoke.

6. Pin shortened another 0.03 inch for a total of 0.12 inch – NOTE: will not unlock to 2nd detent position on its own accord.

No.	Cable Load (lb)	Cable Angle to Horizon (°)	Actuator Pressure (lb/in^2g) Unlock	Trial	If Release
1	1000	0	–	325	✓
2	1000	0	–	325	✓
3	1000	0	–	325	✓
4	1000	0	–	325	✓
5	1000	0	–	275	✓
6	2000	0	–	550	✓
7	2000	0	–	600	✓
8	2000	0	–	550	✓
9	2000	0	–	525	✓
10	2000	0	–	525	✓
11	3000	0	–	750	✓
12	3000	0	–	800	✓
13	3000	0	–	750	✓
14	3000	0	–	750	✓
15	3000	0	–	725	✓
16	3000	0	–	725	✓
17	3000	0	–	800	✓
18	3000	0	–	750	✓
19	3000	0	–	700	✓
20	3000	0	–	800	✓

No.	Cable Load (lb)	Cable Angle to Horizon (°)	Actuator Pressure ($lb/in^2 g$) Unlock	Trial	If Release
21	4000	0	–	900	√
22	4000	0	–	1000	√
23	4000	0	–	975	√
24	4000	0	–	950	√
25	4000	0	–	950	√
26	4000	0	–	1000	√
27	4000	0	–	1000	√
28	4000	0	–	975	√
29	4000	0	–	1050	√
30	4000	0	–	1050	√
31	5000	0	–	1175	√
32	5000	0	–	1225	√
33	5000	0	–	1225	√
34	5000	0	–	1300	√
35	5000	0	–	1225	√
36	5000	0	–	1150	√
37	5000	0	–	1325	√
38	5000	0	–	1250	√
39	5000	0	–	1200	√
40	5000	0	–	1350	√
41	6000	0	–	1500	√
42	6000	0	–	1600	√
43	6000	0	–	1500	√
44	6000	0	–	3000	*
45	6000	0	–	1500	√
46	6000	0	–	1500	√
47	6000	0	–	1350	√
48	6000	0	–	1475	√
49	6000	0	–	1500	√
50	6000	0	–	1500	√

*No release – pin hung up; eventually released by jiggling and banging.

7. At this point a new piston was fabricated with a overall length of 2.41 inches (an increase of 0.15 inch). The unit was assembled utilizing an unmodified (except for yoke) QD mechanism. All systems locked both open and closed with 0 clearance between the piston and the cam in the closed position. This is to be subjected to a retest of the above for 300 cycles providing the base plate assembly (namely the pin) and the cable eye survive. The pin already shows some deformation.

No.	Cable Load (lb)	Cable Angle to Horizon (°)	Actuator Pressure (lb/in^2g) Unlock	Trial	If Release
1	1000	0	–	450	√
2	2000	0	–	725	√
3	3000	0	–	1125 slow	√
4	3000	0	–	1000 rapid	√
5	4000	0	–	1350 slow	√
6	4000	0	–	1200 rapid	√
7	5000	0	–	1550 slow	√
8	5000	0	–	1500 rapid	√
9	6000	0	–	1750 slow	
				1700 rapid	

– No Data Taken

The previous nine trials verified the modification of the new piston. The following is the 1 through 300 series necessary to verify reliability:

No.	Load (lb)	Pressure (lb/in^2)	If Release	No.	Load (lb)	Pressure (lb/in^2)	If Release
1	1000	350	✓	40	2000	625	✓
2	1000	300	✓	41	3000	875	✓
3	1000	350	✓	42	3000	850	✓
4	1000	350	✓	43	3000	850	✓
5	1000	350	✓	44	3000	900	✓
6	1000	350	✓	45	3000	825	✓
7	1000	350	✓	46	3000	875	✓
8	1000	350	✓	47	3000	850	✓
9	1000	350	✓	48	3000	800	✓
10	1000	350	✓	49	3000	850	✓
11	1000	350	✓	50	3000	825	✓
12	1000	350	✓	51	3000	825	✓
13	1000	350	✓	52	3000	900	✓
14	1000	350	✓	53	3000	850	✓
15	1000	350	✓	54	3000	850	✓
16	1000	350	✓	55	3000	900	✓
17	1000	350	✓	56	3000	900	✓
18	1000	350	✓	57	3000	850	✓
19	1000	350	✓	58	3000	900	✓
20	1000	350	✓	59	3000	900	✓
21	2000	625	✓	60	3000	875	✓
22	2000	600	✓	61	4000	1100	✓
23	2000	600	✓	62	4000	1175	✓
24	2000	600	✓	63	4000	1075	✓
25	2000	600	✓	64	4000	1050	✓
26	2000	600	✓	65	4000	1050	✓
27	2000	600	✓	66	4000	1075	✓
28	2000	575	✓	67	4000	1100	✓
29	2000	600	✓	68	4000	1050	✓
30	2000	575	✓	69	4000	1050	✓
31	2000	575	✓	70	4000	1050	✓
32	2000	575	✓	71	4000	1050	✓
33	2000	600	✓	72	4000	1100	✓
34	2000	600	✓	73	4000	1125	✓
35	2000	625	✓	74	4000	1100	✓
36	2000	625	✓	75	4000	1025	✓
37	2000	625	✓	76	4000	1025	✓
38	2000	600	✓	77	4000	1100	✓
39	2000	625	✓	78	4000	1075	✓

No.	Load (lb)	Pressure (lb/in^2)	If Release	No.	Load (lb)	Pressure (lb/in^2)	If Release
79	4000	1100	√	118	6000	1600	√
80	4000	1125	√	119	6000	1625	√
81	5000	1300	√	120	6000	2200	√
82	5000	1300	√	121	5000	1350	√
83	5000	1300	√	122	5000	1400	√
84	5000	1300	√	123	5000	1375	√
85	5000	1300	√	124	5000	1300	√
86	5000	1250	√	125	5000	1350	√
87	5000	1300	√	126	5000	1350	√
88	5000	1325	√	127	5000	1400	√
89	5000	1400	√	128	5000	1350	√
90	5000	1275	√	129	5000	1400	√
91	5000	1400	√	130	5000	1350	√
92	5000	1300	√	131	5000*	1800	√
93	5000	1350	√	132	5000	1325	√
94	5000	1375	√	133	5000	1350	√
95	5000	1375	√	134	5000	1325	√
96	5000	1500	√	135	5000	1250	√
97	5000	1400	√	136	5000	1325	√
98	5000	1350	√	137	5000	1375	√
99	5000	1375	√	138	5000	1500	√
100	5000	1350	√	139	5000	1450	√
101	6000	1700	√	140	5000	1475	√
102	6000	1650	√	141	4000	1100	√
103	6000	1600	√	142	4000	1100	√
104	6000	1600	√	143	4000	1175	√
105	6000	1600	√	144	4000	1100	√
106	6000	1600	√	145	4000	1100	√
107	6000	1600	√	146	4000	1175	√
108	6000	1625	√	147	4000	1100	√
109	6000	1525	√	148	4000	1100	√
110	6000	1600	√	149	4000	1100	√
111	6000*	2100	√	150	4000	1125	√
112	6000*	2400	√	151	4000*	1500	√
113	6000	1400	√	152	4000	1100	√
114	6000	1575	√	153	4000	1100	√
115	6000	1550	√	154	4000	1100	√
116	6000	1600	√	155	4000	1100	√
117	6000	1650	√	156	4000	1150	√

No.	Load (lb)	Pressure (lb/in^2)	If Release	No.	Load (lb)	Pressure (lb/in^2)	If Release
157	4000	1150	√	196	2000	600	√
158	4000	1150	√	197	2000	600	√
159	4000	1150	√	198	2000	600	√
160	4000	1200	√	199	2000	600	√
161	3000	800	√	200	2000	600	√
162	3000	850	√	201	1000	350	√
163	3000	850	√	202	1000	350	√
164	3000	800	√	203	1000	350	√
165	3000	850	√	204	1000	350	√
166	3000	900	√	205	1000	350	√
167	3000	850	√	206	1000	400	√
168	3000	875	√	207	1000	400	√
169	3000	875	√	208	1000	375	√
170	3000	850	√	209	1000	375	√
171	3000	900	√	210	1000	350	√
172	3000	875	√	211	1000*	3000	√
173	3000	875	√	212	1000*	900	√
174	3000	875	√	213	1000	400	√
175	3000	850	√	214	1000*	1500	√
176	3000	900	√	215	1000	450	√
177	3000	1000	√	216	1000	350	√
178	3000	1000	√	217	1000	375	√
179	3000	900	√	218	1000	350	√
180	3000	900	√	219	1000	375	√
181	2000	600	√	220	1000	375	√
182	2000	650	√	221	2000	600	√
183	2000	650	√	222	2000	600	√
184	2000	650	√	223	2000	600	√
185	2000	650	√	224	2000	600	√
186	2000	600	√	225	2000	725	√
187	2000	625	√	226	2000	600	√
188	2000	700	√	227	2000	650	√
189	2000	600	√	228	2000	650	√
190	2000	625	√	229	2000	625	√
191	2000	700	√	230	2000	650	√
192	2000	650	√	231	2000*	1000	√
193	2000	650	√	232	2000*	1000	√
194	2000*	900	√	233	2000	700	√
195	2000*	900	√	234	2000	700	√

No.	Load (lb)	Pressure (lb/in^2)	If Release	No.	Load (lb)	Pressure (lb/in^2)	If Release
235	2000	625	✓	273	4000	1150	✓
236	2000	625	✓	274	4000	1150	✓
236	2000	625	✓	275	4000	1100	✓
237	2000	600	✓	276	4000	1100	✓
238	2000	600	✓	277	4000**	1075	✓
239	2000	625	✓	278	4000	1200	✓
240	2000	600	✓	279	4000**	1150	✓
241	3000*	1500	✓	280	4000	1150	✓
242	3000*	1600	✓	281	5000	1900	✓
243	3000*	1900	✓	282	5000*	2400	✓
244	3000	850	✓	283	5000	1400	✓
245	3000	850	✓	284	5000	2300	✓
246	3000	900	✓	285	5000	1500	✓
247	3000*	1200	✓	286	5000	1450	✓
248	3000*	1500	✓	287	5000	1400	✓
249	3000	850	✓	288	5000	1475	✓
250	3000	900	✓	289	5000	1450	✓
251	3000	850	✓	290	5000	1475	✓
252	3000	600	✓	291	5000	1325	✓
253	3000	900	✓	292	5000	1325	✓
254	3000	900	✓	293	5000	1350	✓
255	3000	900	✓	294	5000	1350	✓
256	3000	825	✓	295	5000	1325	✓
257	3000	875	✓	296	5000	1325	✓
258	3000	850	✓	297	5000	1375	✓
259	3000	900	✓	298	5000	1325	✓
260	3000	850	✓	299	5000	1425	✓
261	3000	1150	✓	300	5000	1400	✓
262	4000	1100	✓	301	6000	1700	✓
263	4000	1050	✓	302	6000*	3000	✓
264	4000	1050	✓	303	6000	5000	✓
265	4000	1000	✓	304	6000*	2000	✓
266	4000	1200	✓	305	6000	1650	✓
267	4000	1200	✓	306	7000	1900	✓
268	4000	1050	✓	307	7000	1800	✓
269	4000	1150	✓	308	7000	1900	✓
270	4000	1150	✓	309	7000	1850	✓
271	4000	1100	✓	310	7000*	2300	✓
272	4000	1125	✓	311	8000	2200	✓

No.	Load (lb)	Pressure (lb/in^2)	If Release	No.	Load (lb)	Pressure (lb/in^2)	If Release
312	8000*	2800	√	317	10000	2700	√
313	8000	2150	√	318	10000	2550	√
314	8000	2150	√	319	10000	2700	√
315	8000	2100	√	320	10000	2750	√
316	10000	3000	√				

* Hangup.
** Slight hangup.

Vertical Pull		
Load (lb)	Unlock	Release
1000	NO/NO	NO/NO
"		
"		
"		
2000	NO	NO
"		
"		
"		
3000	NO	NO
"		
"		
"		
4000	NO	NO
"		
"		
"		
5000	NO	NO
"		
"		
"		
6000	NO	NO
"		
"		
"		
7000	NO	NO
"		
"		
"		
8000	NO	NO
"		
"		
"		

Vertical Pull (Cont'd)

Load (lb)	Unlock	Release
9000		
"	NO	NO
"		
"		
"		
10000	NO	NO

APPENDIX C

DESIGN CHANGES

FOR

QUICK-DISCONNECT HOUSING ASSEMBLIES

(PART NUMBERS 13222EOO52 AND 13222EOO53)

(1ST, 2ND, AND 3RD GENERATION)

1ST GENERATION

REBUILD OF QUICK-DISCONNECT HOUSING ASSEMBLY

Two quick-disconnect housing assemblies (shop numbers 15 and 16) have been modified as noted below.

Modification

Part No.	RH Assembly No. 16	LH Assembly No. 15
13222EOO89 Housing	Clean, repaint, and change locator dowel pins to .375 ± .0002 .0000 X 1.00 long hardened alloy steel dowel pins.	Same as 16
13222EOO79 Cover	Clean, repaint, and modify as shown on drawing QDHA 1.	Same as 16
13222EOO96 Actuator Assy	Utilize the longer piston and cylinder as previously noted and fabricated.	Same as 16
13222EOO85 Link	Modified per drawing QDHA-2. Hardness final R_c 32.	Hardness final R_c 36
	Final Dimensional Checks	
	A 2.663 B 1.117 C 1.497 D 0.70 E 0.633 to 0.635	A 2.654 B 1.125 to 1.135 C 1.492 D 0.70 E 0.635 to 0.637

Modification

Part No.	RH Assembly No. 16	LH Assembly No. 15
13222EOO84 Yoke	Complete remake of yoke – newly fabricated. Modified as per drawing QDHA 3. Hardness final R_c 40.	Hardness final R_c 41
	Final Dimensional Checks	
	A 2.172 B 0.623 C 1.004 D 0.850 E 0.806 F 1.563	A 2.169 B 0.626 C 1.000 D 0.860 E 0.800 to 0.804 F 1.560
13222EOO83	No changes other than straightening of existing part and heat treatment.	Same as 16.
	R_c 41/42	R_c 40/42
	Modifications to this piece require using 4140 steel and an R_c of 48 to 52. Recommend a more prudent range of R_c 40 to 45.	Same as 16.
13222EOO82 Shaft Spline	No changes other than tank straightening of splines on existing part and heat treatment.	Same as 16.
	Actual R_c 38/40	Actual R_c 37/41
	Modifications to this piece required using 4140 steel and an R_c of 48 to 52. Recommend a more prudent range of R_c 40 to 45.	Same as 16.
13222EOO87 Lever	No change required.	

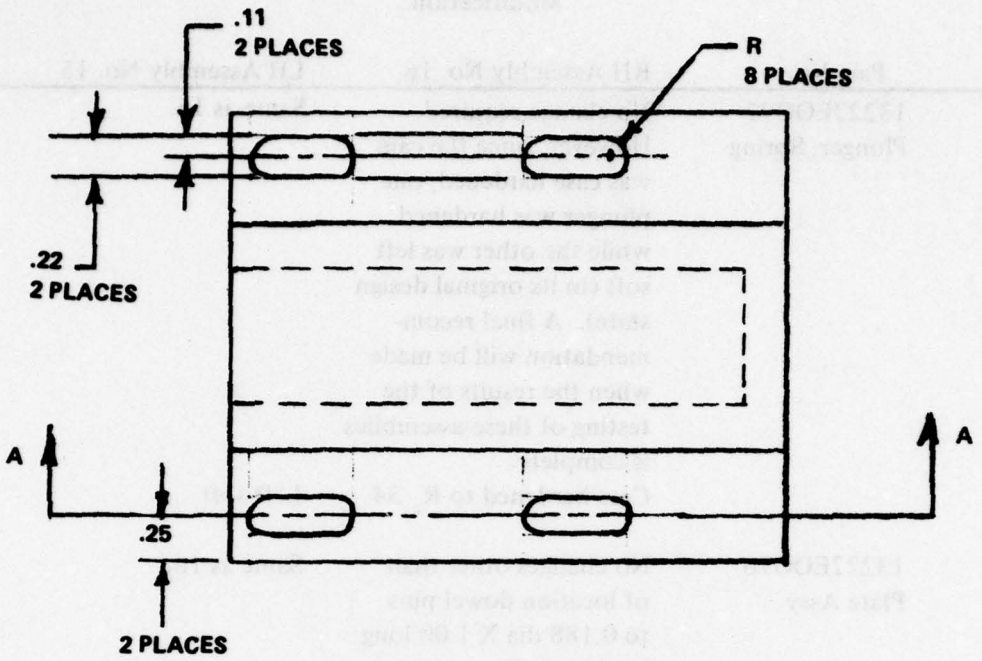
Modification

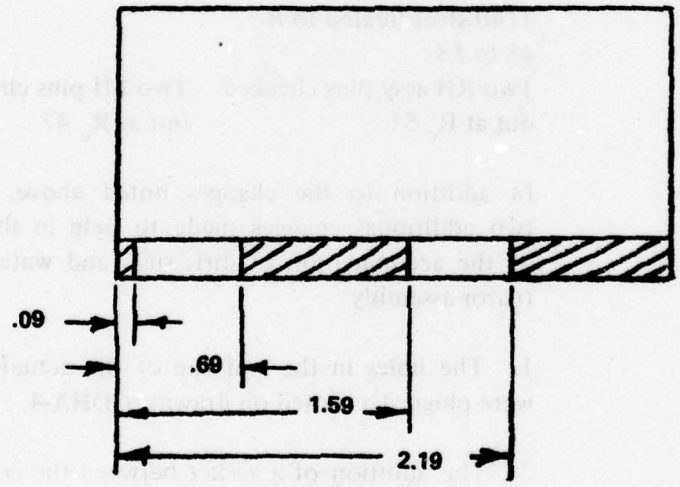
Part No.	RH Assembly No. 16	LH Assembly No. 15
13222EOO92 Plunger, Spring	No change required. However, since the cam was case hardened, one plunger was hardened while the other was left soft (in its original design state). A final recommendation will be made when the results of the testing of these assemblies is complete.	Same as 16.
	Case hardened to R_c 34	Left soft
13222EOO76 Plate Assy	No changes other than of location dowel pins to 0.188 dia X 1.00 long hardened alloy steel dowel pins.	Same as 16.
13222EOO86 Pin	No dimensional change; only a material change to 4140 steel treated to R_c 48 to 53.	Same as 16.
	Two RH assy pins checked out at R_c 51.	Two LH pins checked out at R_c 47.

In addition to the changes noted above, there were two additional changes made to help in the reduction of the accumulation of dirt, rust, and water in the actuator assembly:

1. The holes in the end cap of the actuator assembly were plugged as noted on drawing QDHA-4.

2. The addition of a gasket between the cover (13222-EOO92) and the actuator assembly as noted on drawing QDHA-5.





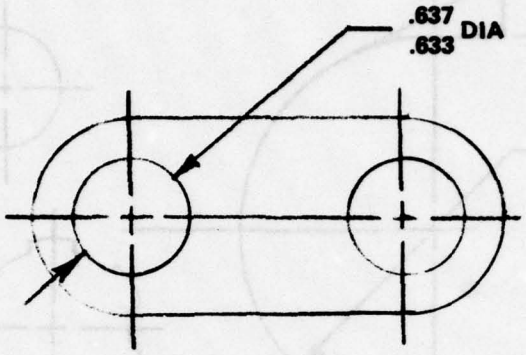
SECTION AA

MOD:

Hole Slots: To facilitate MTG when using longer actuator assembly and a seal gasket between cover and actuator assembly.

COVER
(PN 13222E0079)

QDHA-1

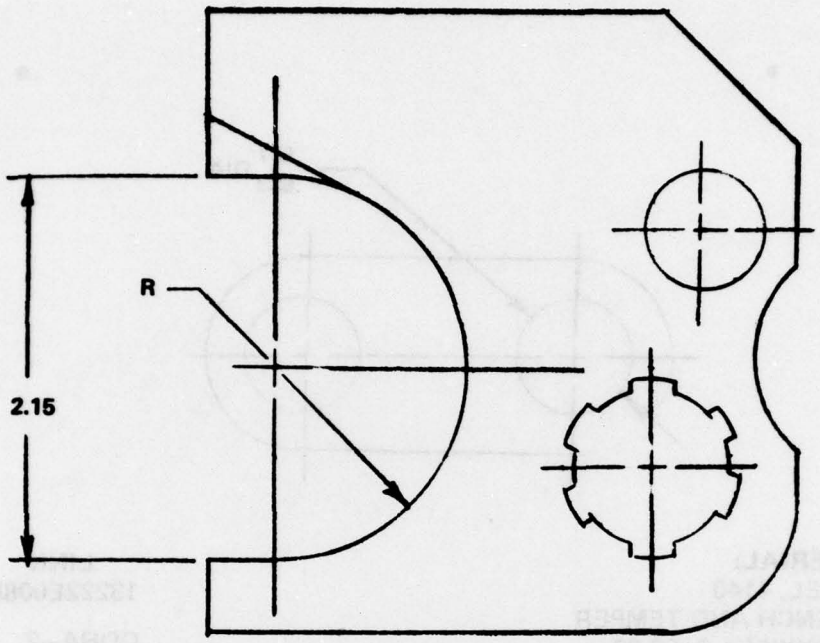


MATERIAL:
STEEL, 4140
QUENCH AND TEMPER
ROCKWELL C 28-32

LINK
13222E0085

QDHA–2

Further Recommend:
Rc 30 to 35 to coincide with lever and yoke
Dia be reduced – .631 to 6.35

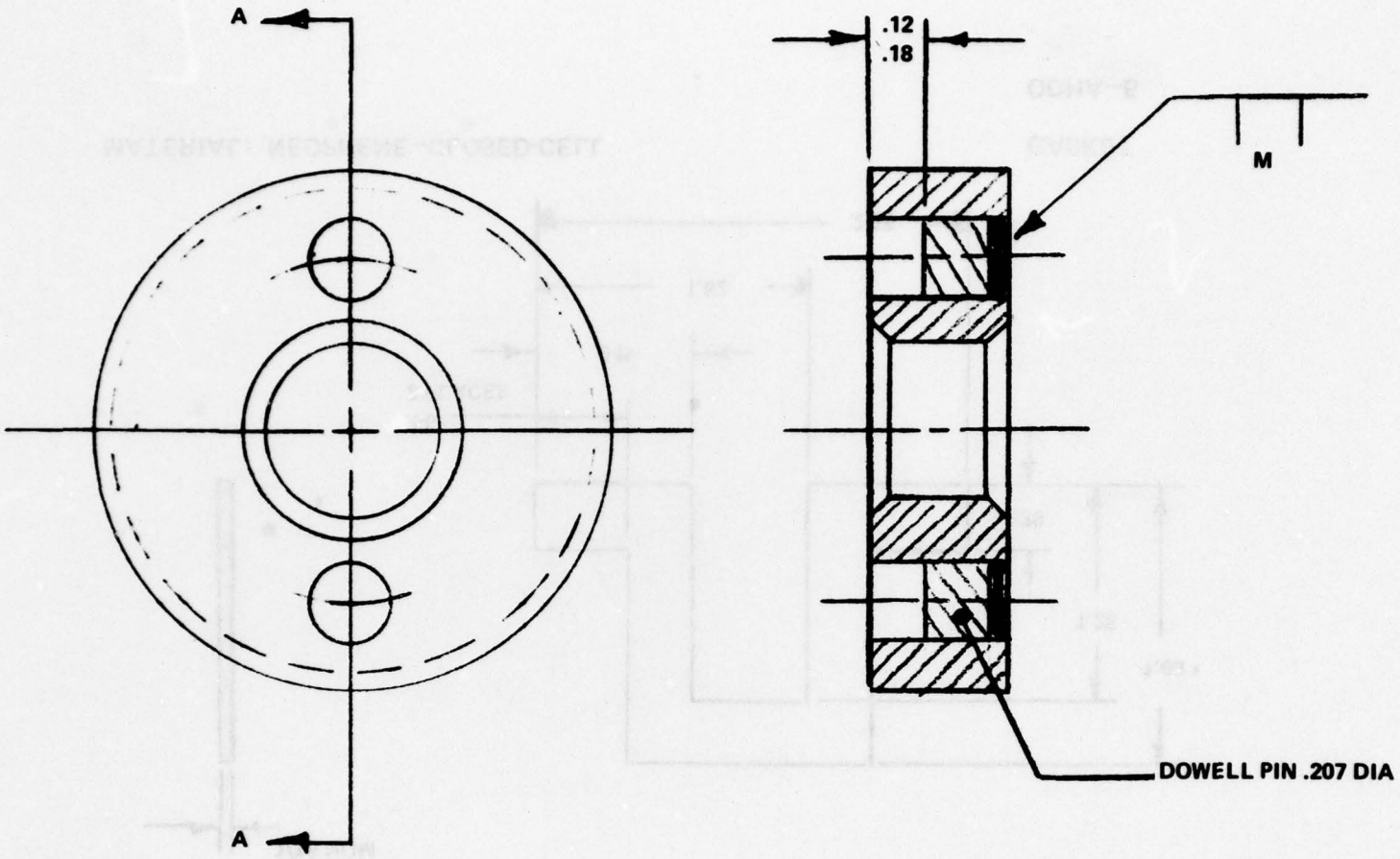


MATERIAL:
STEEL 4140
QUENCH AND TEMPER
ROCKWELL C 30-35

YOKE
13222E0084

QDHA–3

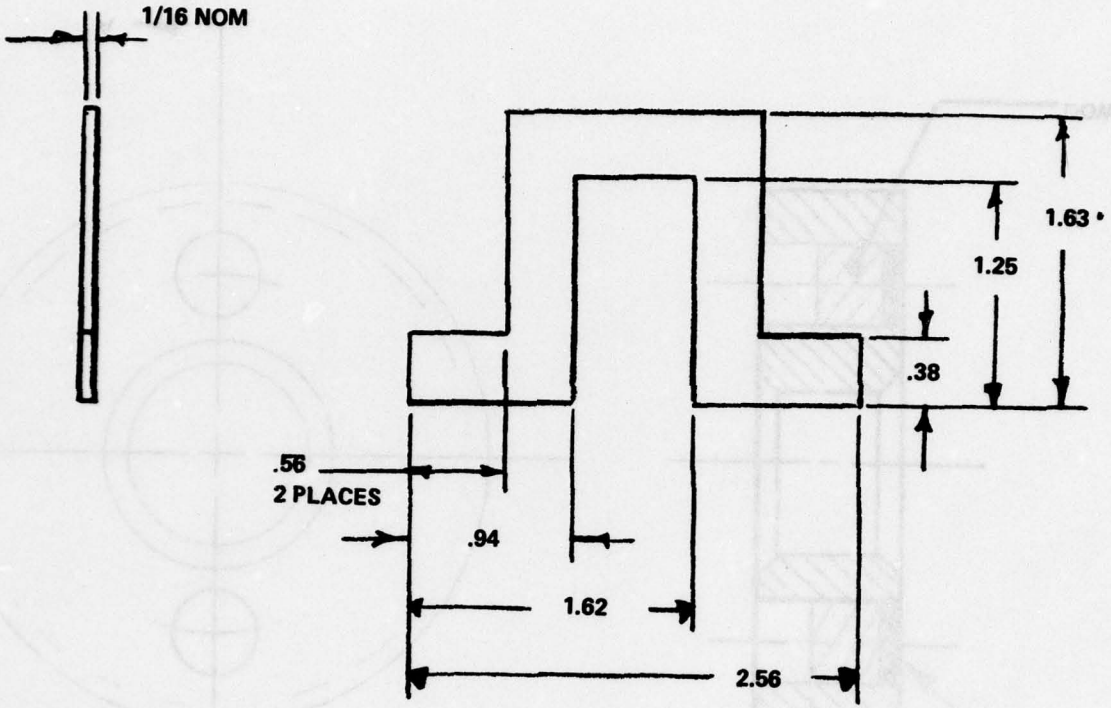
Further Recommend:
The tolerances are ± .03; change the 2.15 diameter to 2.18 and move the hole center .18 inch to the right.



SECTION AA

END CAP, ACTUATOR ASSEMBLY

QDHA–4



MATERIAL: NEOPRENE–CLOSED-CELL

GASKET

QDHA–5

2ND GENERATION

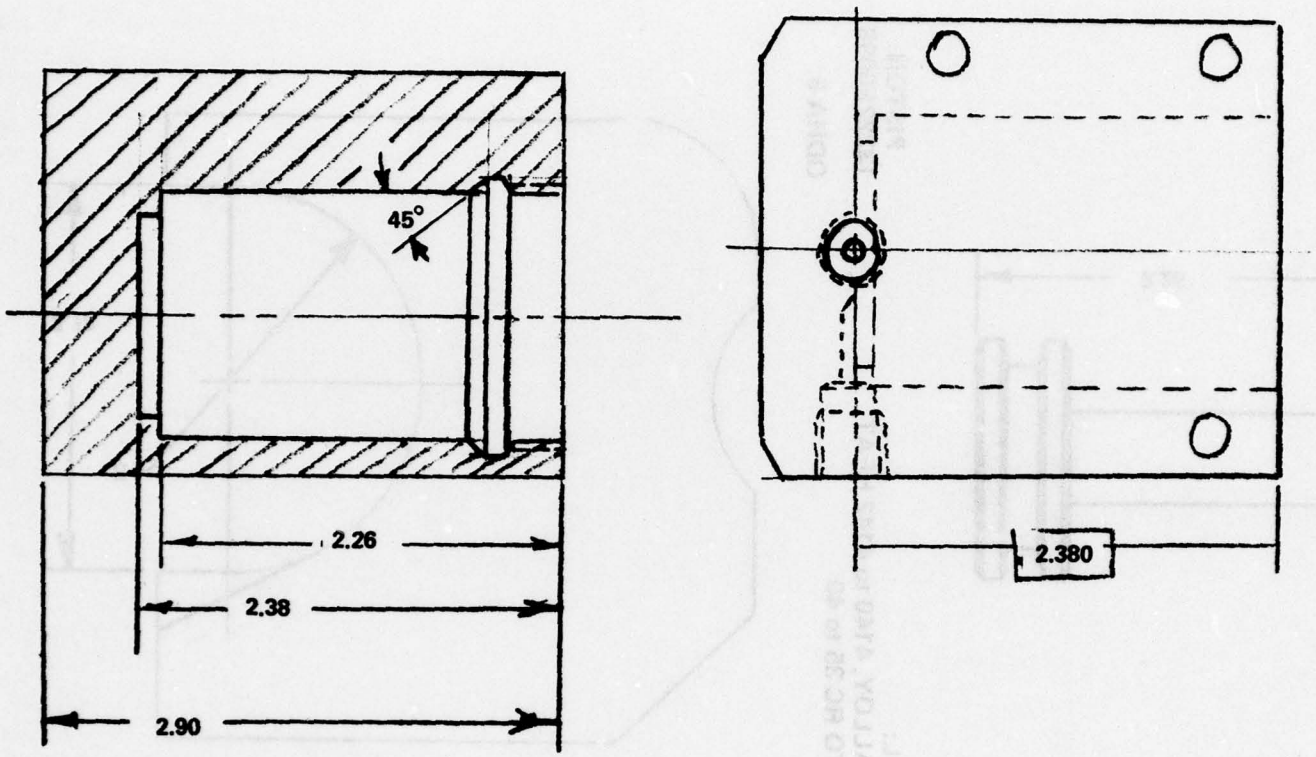
REBUILD OF QUICK-DISCONNECT HOUSING ASSEMBLY

Two quick-disconnect housing assemblies have been modified as noted below:

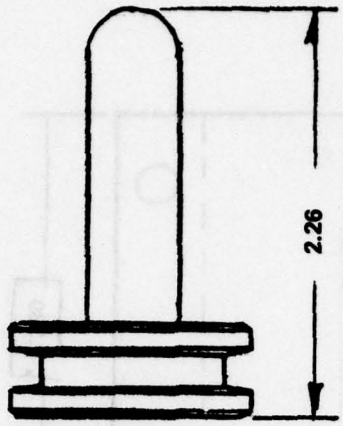
Part No.	Modification RH Assembly LH Assembly
13222EOO89 Housing	Clean, repaint, and change locator dowel pins to .375 $^{+.0002}_{-.0000}$ X 1.00 long hardened allow steel dowel pins.
13222EOO79 Cover	Clean, repaint, and modify as shown on the drawing QDHA-1 inclosed with the first generation rebuild package.
13222EOO96 Actuator Assy	Utilized the longer piston and matching cylinder as previously noted and fabricated. New ones were made for each assembly. See QDHA-6 and -7 for changes. New pistons hardened to R_c 38. Note also that chamfer added to this to facilitate assembly without "0" ring damage.
13222EOO85 Link	Modified as shown on drawing QDHA-2 and as done on first generation modification, and heat treated to an R_c of 34. Dimensions are as previously noted.
13222EOO84 Yoke	Modified existing yokes per drawing QDHA-8. However, ends deformed slightly due to previous damage encountered at APG. Heat treated to R_c 42. Actual measurement of gap opening is 2.1814 for both.
13222EOO83 Shaft, Spline	No changes other than straightening of existing part and heat treatment to R_c 48.
13222EOO82 Shaft, Spline	No changes other than straightening of existing part, and heat treatment to R_c 47 to R_c 50.
13222EOO87 Lever	No changes required.

Modification

Part No.	RH Assembly LH Assembly
13222EOO92 Plunger, Spring	The only change was to case-harden the plungers to R_c 50.
13222EOO76 Plate Assy	No changes other than of locator dowel pins to .188 dia X 1.00 long hardened alloy steel dowel pins.
13222EOO86 Pin	No dimensional change; only a material change to 4340 steel treated to R_c 48/49. In addition to the changes noted above, there were two additional changes made to aid in reducing the accumulation of dirt, water, and rust in the actuator assembly. 1. The holes in the end cap of the assembly were plugged as noted on drawing QDHA-4 of the first generation mods. 2. The addition of a gasket between the cover and the actuator assembly as denoted on QDHA-5 of the first generation mod.



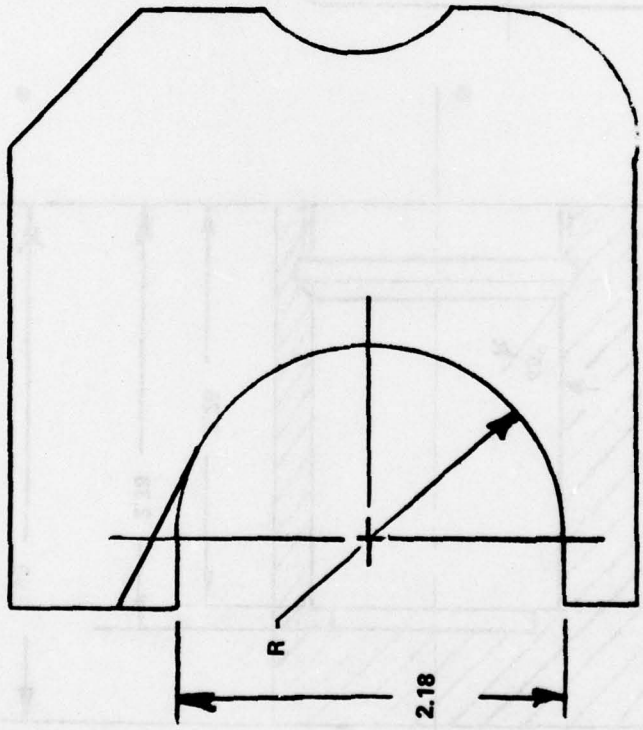
CYLINDER
13222E0097
QDHA-7



MATERIAL:
STEEL, ALLOY, 4140 to 4142 HEAT TREAT TO RC 35 to 40

PISTON
13222E0098

QDHA-6



QDHA-8

YOKE
13222E0084

3RD GENERATION

REBUILD OF QUICK-DISCONNECT HOUSING ASSEMBLY

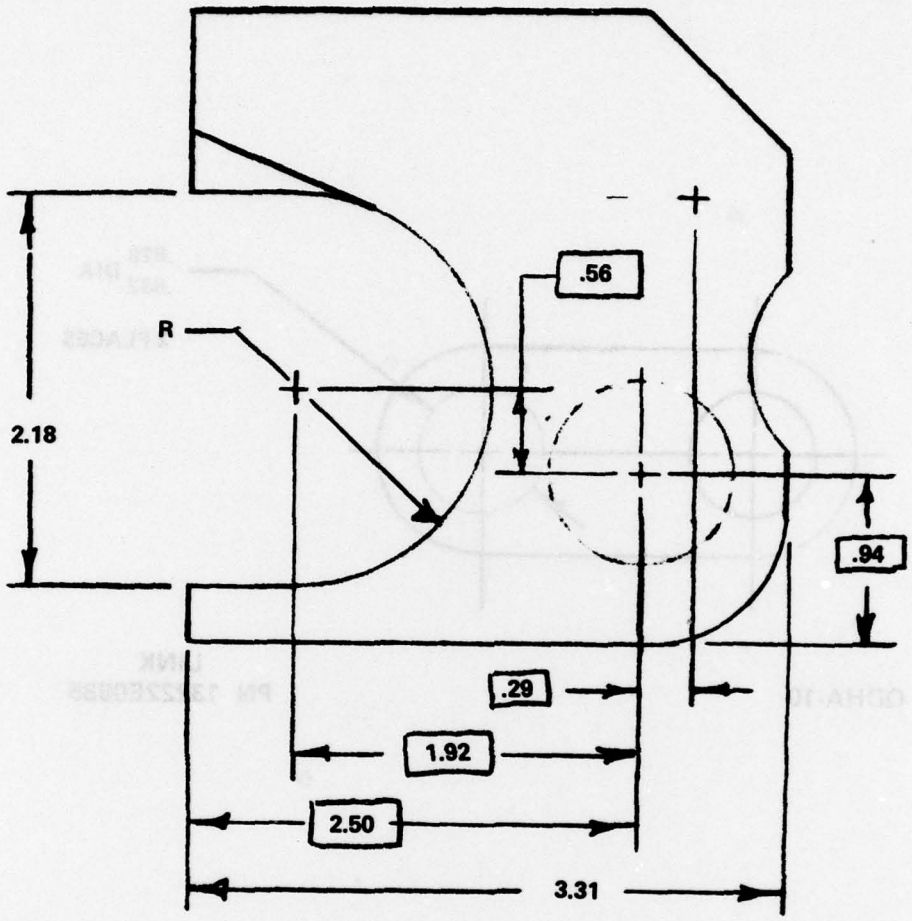
Two quick-disconnect housing assemblies (QDHA) have been modified as noted below:

Modification

Part No.	RH Assembly LH Assembly
13222EOO89 Housing	Clean, repaint, and change locator dowel pins to .375 $\pm$ .0002 .0000 X 1.000 long hardened alloy steel dowel pins
13222EOO79 Cover	No cover plates available at this time. If they are utilized, they will be as drawing QDHA-1 depicts.
13222EOO96 Actuator Assy	Utilized the longer piston and matching cylinder as previously noted and fabricated for 2nd generation QDHA. Now pistons hardened to R_c.
13222EOO85 Link	Modified per drawing QDHA-10 and heat-treated to an R_c of 42 to 44 (design level 35 to 40).
13222EOO84 Yoke	Modified existing yokes per drawing QDHA-9. However, end deformed slightly due to previous damage encountered at APG. Heat-treated to R_c 40 to 42 (design level 35 to 40).
13222EOO83 Shaft, Spline	No changes other than straightening of existing part and heat treatment to R_c 43.5 (design level 40 to 45).
13222EOO82 Shaft, Spline	No changes other than straightening of existing part and heat-treating to R_c 42 (design level 40 to 45).
13222EOO87 Lever	No changes other than reheat treating to R_c 42 (design level 35 to 40).
13222EOO92 Plunger, Spring	Had to remanufacture both units completely due to no serviceable items. Copy of original. The plunger was case hardened to R_c 63.

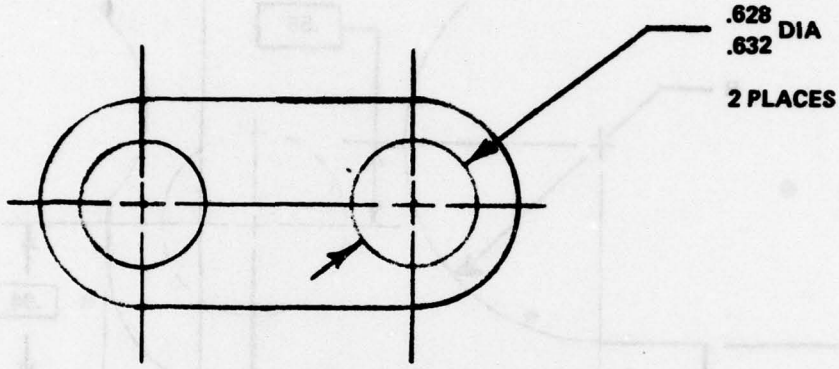
Modification

Part No.	RH Assembly LH Assembly
13222EOO76 Plate Assy	No changes other than of locator dowel pins to .188 dia X 1.00 lg hardened alloy steel dowel pins.
13222EOO86 Pin	No dimensional change; only a material change to 4340 steel treated to R_c 48/49 (recommend only 40 to 45 on all future pins).
	In addition to the changes noted above, one additional change was made to aid in reducing the accumulation of dirt, water, and rust in the actuator assembly.
	The holes in the end cap of the assembly were plugged as noted on drawing QDHA-4 of the first generation model.
	Had the cover (PN 13222EOO79) been available, it also would have been modified as shown on QDHA-1, and the gasket depicted by QDHA-5 would have been added.



QDHA-9

YOKE
PN 13222E0084



QDHA-10

LINK
PN 13222E0085

DISTRIBUTION FOR MERADCOM REPORT 2264

No. Copies	Addressee
	Department of Defense
12	Defense Documentation Center Cameron Station Alexandria, VA 22314
	Department of the Army
1	Commander, HQ TRADOC ATTN: ATEN-ME Fort Monroe, VA 23651
1	HQDA (DAMA-AOA-M) Washington, DC 20310
1	HQDA (DALO-TS M-P) Washington, DC 20310
1	HQDA (DAEN-RDL) Washington, DC 20314
1	HQDA (DAEN-MCE-D) Washington, DC 20314
1	Director Army Materials and Mechanics Research Center ATTN: DRXMR-STL, Tech Lib Watertown, MA 02172
1	Commander US Army Aberdeen Proving Ground ATTN: STEAP-MT-U (GE Branch) Aberdeen Proving Ground, MD 21005
2	Director US Army Materiel Systems Analysis Agency ATTN: DRXSY-CM DRXSY-MP Aberdeen Proving Ground, MD 21005
1	Director US Army Ballistic Research Lab ATTN: DRDAR-TSB-S (STINFO) Aberdeen Proving Ground, MD 21005
2	Engineer Representative US Army Standardization Group, UK Box 65, FPO New York 09510
	Technical Library Chemical Systems Laboratory Aberdeen Proving Ground, MD 21005
1	Commander Rock Island Arsenal ATTN: SARRI-LPL Rock Island, IL 61201
1	Plastics Technical Evaluation Center Picatinny Arsenal, Bldg 176 ATTN: A. M. Anzalone SARPA-FR-M-D Dover, NJ 07801
1	Learning Resources Center US Army Engineer School Bldg 270 Fort Belvoir, VA 22060
1	President US Army Armor and Engineer Board ATTN: ATZK-AE-TD-E Fort Knox, KY 40121
1	Director US Army TRADOC Systems Analysis Activity ATTN: ATAA-SL (Tech Lib) White Sands Missile Range, NM 88002
1	HQ, USAEUR & Seventh Army Deputy Chief of Staff, Operations ATTN: AEAGC-FMD APO New York 09403
	MERADCOM
1	Commander, DRDME-Z Technical Director, DRDME-ZT Assoc Tech Dir/R&D, DRDME-ZN Assoc Tech Dir/Engrg & Acq, DRDME-ZE Spec Asst/Matl Asmt, DRDME-ZG Spec Asst/Tech Asmt, DRDME-ZK CIRCULATE
1	Chief, Ctrmine Lab, DRDME-N Chief, Engy & Wtr Res Lab, DRDME-G Chief, Elec Pwr Lab, DRDME-E Chief, Cam & Topo Lab, DRDME-R Chief, Mar & Br Lab, DRDME-M Chief, Mech & Constr Eqpt Lab, DRDME-H Chief, Ctr Intrus Lab, DRDME-X Chief, Matl Tech Lab, DRDME-V Director, Product A&T Dir, DRDME-T CIRCULATE

No. Copies	Addressee
6	Countermine Lab, DRDME-N
6	Mine Neut Div, DRDME-NN
3	Tech Reports Ofc, DRDME-WP
3	Security Ofc (for liaison officers), DRDME-S
2	Tech Library, DRDME-WC
1	Programs & Analysis Dir, DRDME-U
1	Pub Affairs Ofc, DRDME-I
1	Ofc of Chief Counsel, DRDME-L
	Department of the Navy
1	Director, Physics Program (421) Office of Naval Research Arlington, VA 22217
1	Director Naval Research Laboratory ATTN: Code 2627 Washington, DC 20375
1	Commander, Naval Facilities Engineering Command Department of the Navy ATTN: Code 032-A 200 Stovall Street Alexandria, VA 22332
1	US Naval Oceanographic Office Library (Code 1600) Washington, DC 20373
1	Officer-in-Charge (L31) Civil Engineering Laboratory Naval Construction Battalion Ctr Port Hueneme, CA 93043
1	Director Earth Physics Program Code 463 Office of Naval Research Arlington, VA 22217
1	Naval Training Equipment Ctr ATTN: Technical Library Orlando, FL 32813
	Department of the Air Force
1	HQ USAF/RDPS (Mr. Allan Eaffy) Washington, DC 20330
1	Mr. William J. Engle Chief, Utilities Branch HQ USAF/PREEU Washington, DC 20332

No. Copies	Addressee
1	AFSC/INJ Andrews AFB, MD 20334
1	AFCEC/XR/21 Tyndall AFB, FL 32401
1	HQ USAF/PREES ATTN: Mr. Edwin B. Mixon Bolling AFB-Bldg 626 Washington, DC 20332
1	AFAPL/SFL Wright-Patterson AFB, OH 45433
	Others
1	Department of Transportation Library, FOB 10A, TAD-494.6 800 Independence Ave., SW Washington, DC 20591
1	Professor Raymond R. Fox School of Engineering and Applied Science The George Washington University Washington, DC 20052
1	Reliability Analysis Center Rome Air Development Center ATTN: I. L. Krulac Griffiss AFB, NY 13441